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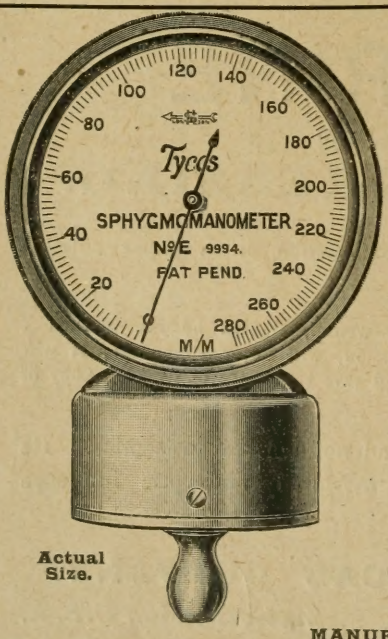

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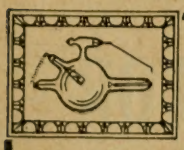

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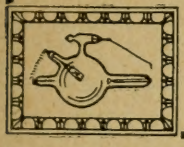

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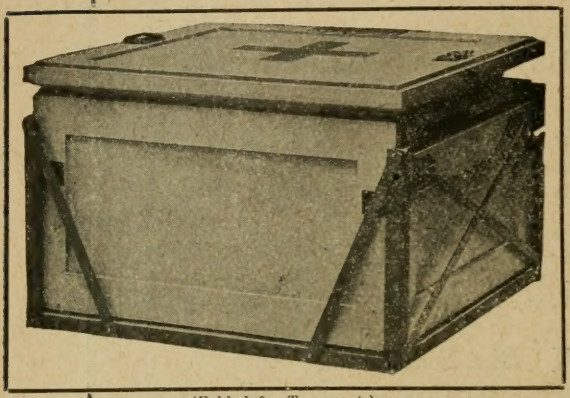

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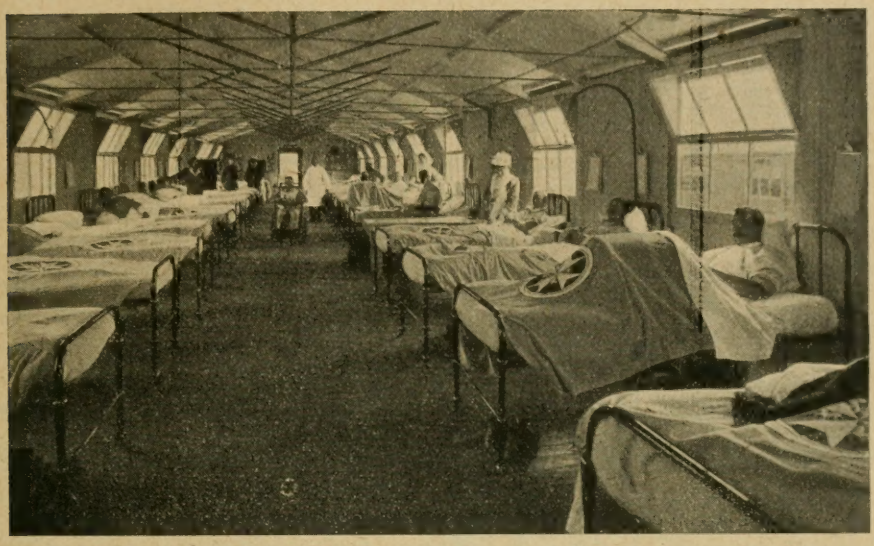

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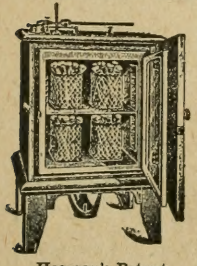

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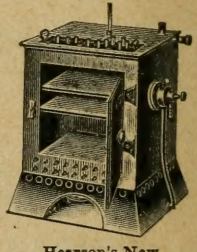

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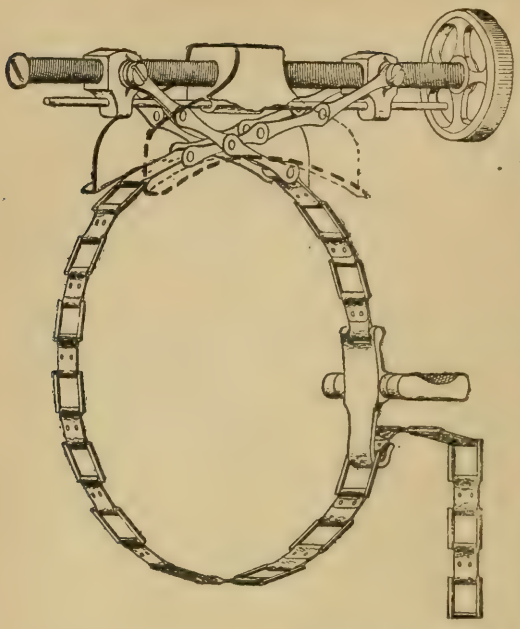

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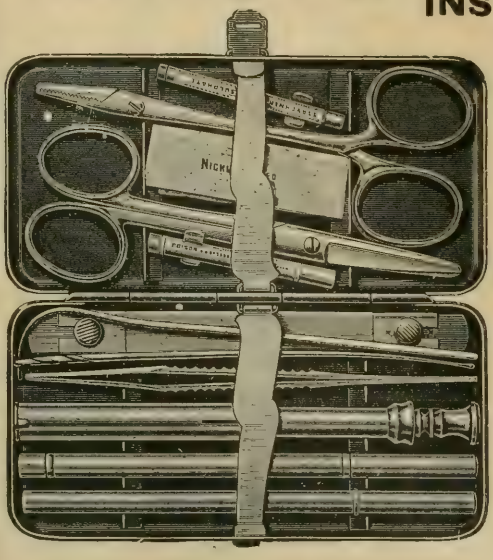

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do.	*bottle of*	100,	2/0
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do.	,, ,,	100,	4/0
gr. 8·75	,, ,,	25.	2 0
,,	,, ,,	100.	7 0

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gr. 6,	*bottle of*	25,	8*d.*
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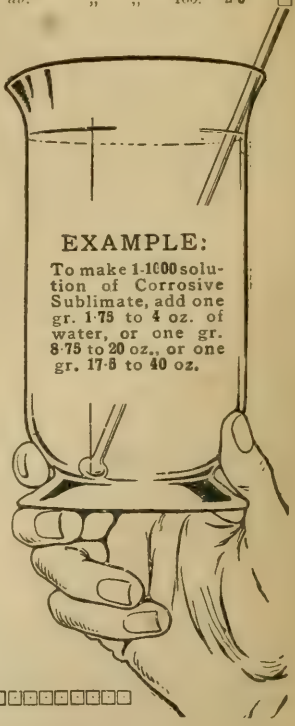
do.	,, ,,	100.	2 0



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A CLINICAL STUDY OF SOME FUNCTIONAL DISORDERS OF THE HEART WHICH OCCUR IN SOLDIERS.[1]

BY J. E. MACILWAINE, B.Sc., M.D., D.P.H.

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THE subject which I propose to discuss in this contribution is one of the utmost difficulty; in fact, during the past two years it has always appeared to me to be the most involved problem I have ever met. At the outset, the title which I have chosen is open to serious objection on account of the term functional disorders. This is a vague and wide term, but in default of a better I have chosen it in preference to a still more indefinite classification which is in use in Army work, viz., D.A.H. (Disordered Action of the Heart). The reason for discarding D.A.H. as a description of any clinical condition is, that practical experience has shown me this pseudo-diagnosis can be so stretched as to include almost any medical ailment. In two previous papers I endeavoured, with the help of my colleagues, to deal with the practical side of the question of cardiac disorders occurring in soldiers on active service; and in these articles we subscribed to the diagnoses V.D.H. and D.A.H. We used these terms with a full recognition of their value when employed under active service conditions. On active service the question most constantly before the M.O. is that of "fitness" or "unfitness" of the soldier for duty. If the decision is that the man is unfit then refinement of diagnosis is often out of the question. The problem differs when the men are examined at a base overseas, as the question to be decided under these circumstances is in another category. At a base a prognosis has to be formed as to the soldier's prospect of returning to duty, and an estimate made of the

[1] Paper read before Ulster Medical Society, December 6, 1917.

probable duration of the treatment he will require to render him fit. Our experience in dealing with over 3,000 cardiac cases at a base overseas taught us that a single thorough clinical examination of a soldier suffering from cardiac symptoms enabled us to make a more accurate diagnosis of the condition present; and to form a prognosis of his prospect of future fitness. In figures, an accurate diagnosis enabled us to dispose immediately of roughly one-third of the above 3,000 men. The remaining two-thirds of these cardiac cases are those I wish to consider to-night, and I have used the term functional in connexion with their description, because clinical examination failed to detect any organic disease which could be considered definitely responsible for the evident cardiac symptoms and signs present.

The clinician is placed in a position of great difficulty in dealing with these cases when he is asked to express an opinion as to the man's disposal after one examination ; indeed, an opinion so expressed is often of very little value. To answer this question of disposal of the soldier, to active service, for duty at the base, or for evacuation to England, it was necessary to use what has been described as an "effort test." This "effort test" was made by submitting these doubtful cases to a course of graduated physical drill which extended over six weeks. The men were able to report sick any day they wished, and be re-examined if necessary. At the end of three weeks each man was re-examined clinically and disposed of, or told to continue the course. On the termination of the six weeks a final examination was made, popularly known amongst the men as "a strafe," and as just a decision as could be formed from an estimation of the man's condition decided his fate, "Active" or "Base"! By this practical method of treatment, roughly one-half of the number of men so treated were classified as fit to undertake another period of active service, whilst the majority of the remaining half were categorized for suitable work at the base. A few of the men developed, during their course of treatment, some conditions which rendered their disposal by evacuation to England advisable. It must be remarked, however, that although the only question of practical importance to an army in the field had been answered, the riddle as to the pathological cause of the men's incapacity had not been solved. Thus, whilst we had evolved an apparently efficient scheme for dealing with the D.A.H. problem at a base overseas, I still felt we were defeated by the question from a scientific medical point of view. This scheme, which congregated together a lot of men complaining of cardiac symptoms associated with a neurasthenic state, was not free from adverse criticism from an army medical point of view. I did not feel that I was capable of judging of its exact value to the military authorities, but it was evolved as a natural sequence of events in the investigation I had been given the opportunity to carry out. For this opportunity I have to thank Colonel H. Carr, C.B., the D.D.M.S. of the administrative area in which we worked, and to Major H. B. Dennis, R.A.M.C., the

A.I.D. (Assistant Inspector of Drafts), I am grateful for instruction in what to me was a new branch of practical medicine. I am, perhaps, most indebted to Surgeon-General C. Burtchaell, C.B., for his interest in this work, for the information he gave me on the subject, and for the opportunity of seeing a portion of the vast work that is being done by the Royal Army Medical Corps outside the hospitals. After seeing this work, I realized how much the existence of an army depends upon the medical man who is also a soldier. The civilian doctor engages in peace times in a practice of medicine in which the individual patient is the most important consideration, whilst the Army doctor, in war time, realizes that the keeping of an army in being is the chief consideration, and that an individual point of view is not possible. It was through considerations of this sort that I learned that the D.A.H. problem has another aspect to the purely medical one which first arrested my attention. On fuller consideration, I began to realize how great was the weight which the War has thrown upon the medical profession by this single question of fitness or unfitness of the individual soldier. To-day the medical officers decide *per diem* thousands of cases which in civil life would occupy the law courts for weeks. Unfortunately many of the cases so decided are not finished with by these decisions. The Army often discards the soldier, and the problem has to be really tackled in civil life. The medical profession stands in a position of trust to the State and to the individual, which is indeed an onerous one. I think this trusteeship is rather comparable to the duties such a position always carries, namely, responsibility, often disapproval of those whom the trust concerns, and inadequate recognition of service rendered.

Throughout the whole experience gained during the two years' work abroad the clinical aspect of this subject, "soldiers' heart," dominated my thoughts. The question of dealing with these men in the Army seemed simple compared with the problem of their return to civil life. I constantly felt that any light we could obtain upon the clinical side of these so-called functional conditions would be an invaluable assistance in dealing with their treatment at home. One of the most striking features of the present War is the partial aspect of many of the clinical observations made. This is due, of course, to the existence of a different atmosphere and different circumstances, according to the place where the clinical observations are made. Thus, up just behind the firing line, in a field ambulance, the clinical pictures in the same men may differ from the clinical pictures at a base hospital overseas. No doubt the clinical condition of the patient is in many cases changed by his safe arrival in Blighty. I mention this, because all the facts I have noted are the result of the work at a base overseas.

The term functional disorder denotes an absence of any known pathological basis for the condition which was so ably described by Da Costa as "Irritable Heart" [1], and Sir James Mackenzie in his paper, "Soldier's

Heart." [2]. In spite of the most searching investigations during the past three years for some definite finding to explain the pathology of this incapacitating syndrome, we are still without exact knowledge as to its cause. If one desires a clinical description of the condition, it is hard to improve upon that of Da Costa. On the other hand, if an analysis of the symptoms, and the study of their possible pathological basis is sought after, the Report of the Medical Research Committee of the work of the Military Hospital at Hampstead supplies the latest scientific information on the subject. Before entering upon deductions from the results of my own clinical observations, I will give a description of the incapacity from which the soldier suffers. The picture varies, but the fundamental factor is, the soldier fails to endure a moderate amount of effort without collapse or fainting; and may be unable to resist exhibiting similar symptoms when under stress of even moderate emotion. The usual history is somewhat like the following: "I am alright if I go slow, but if I have to try to march with the pack after I have gone, say half a mile, or on the first hill, I begin to feel my heart thumping. Then I get a stabbing pain at the heart, I have a choking sensation in the throat, my eyes get mazy, I feel dizzy, and if I go on I stagger, and then I fall." The man will then say he gets the same syndrome on attempting to double, and sometimes volunteers that he has a similar experience on putting on his gas helmet. The history is the same in substance; but the description of the man varies as to the principal or prominent feature, i.e., pain, dyspnœa, palpitation, vertigo, weakness, fainting, exhaustion, etc. The soldier also often complains of the same symptoms occurring just as he is going to sleep, or his waking with the pain and palpitation and choking sensation. Many other facts connected with this syndrome become evident through the histories of the patients, and an interesting one is how often these men have carried on in spite of their symptoms. It was a common enough story of the man that he managed for months to get in and out of the trenches by taking his own time, and resting on the way up. Another point of interest in the symptomatology was that, if the man did fall out on a hill, often a short rest enabled him to follow on and finish the march. I did not usually have the opportunity to see these men in the fainting condition, but have seen some when they have been lying after falling out, and the feature was, the good colour of the man, with the hurried respiration, profuse sweating, and tachycardia.

In giving the above clinical picture, I have done so instead of trying to define the functional disorder. The condition is so easy to recognize from the symptoms, and the marked tachycardia on emotion or effort, that the most one can do by clinical examination is to find if there is associated with the syndrome any organic disease. The results of the notes taken in careful clinical examination of our first 1,200 cases form the basis of the following remarks. The history of the man was gone into as fully as time permitted, and we followed any clue we could obtain as to previous

infection, trauma, capability during army training, capability during active service, previous rejection as a recruit, etc. In the clinical examination the signs of any organic disease were looked for, and the condition of the teeth and tonsils noted in each man. I may say that all the men were considered as possible subjects of hyperthyroidism unless that possibility was unsupported by the examination. All efforts were directed to determine whether there was any organic heart disease present, endocardial or myocardial. At one period of this work Major Houston made a bacteriological examination of the urine of 100 of these functional cases, and no abnormal condition presented itself. The clinical examinations brought out in many cases the fact that the syndrome was associated with definite organic changes in the respiratory or cardio-vascular systems, in a few cases with Graves's disease, and in some cases that the man was still suffering from a pyrexia of uncertain origin. At the very outset of the investigation I was struck by the condition of the nervous system as exhibited by the state of the reflexes. If one translated it into figures, two-thirds of these men might simply be described as cardiac neurasthenics. I resisted the substitution of neurasthenia as a diagnosis in these men, because it appeared to be of no definite aid in explaining this syndrome; but I felt strongly that this associated neurasthenic state had to be considered an important factor in forming a prognosis as to the probability of recovery of these men fit for active service. After seeing many hundreds of these patients while they were under treatment by graduated exercise, my constant feeling present was one of depression, on account of the evident neurotic element in many of the men. To put it bluntly, their psychological condition was anything but that of a soldier, and this in spite of the fact, if their history was to be credited, that many of them had "stuck it" for months in the trenches. Finally, when now finished with the practical side of the question, I have looked over the notes we have taken, and consider that this group of functional cardiac disorders can be included under the diagnosis neurasthenia. The following theoretical conceptions are brought forward to support this view.

I think to-day that we have reached a point in clinical medicine when it becomes necessary to recognize more fully the functions of the involuntary nervous system. I have endeavoured to make it clear that in a very large proportion of these men who are suffering from this "irritable heart condition," there is a psychological element and an associated neurasthenic state. There is a removal of the ordinary inhibition which prevents a man letting it be obvious that he is not going "up the line" if he can avoid it, and the man persists often, in spite of our contradiction, that he is a "heart case," and is not able to refrain from producing evidence to this effect. Sometimes, on the other hand, the man insists, in spite of an incapacity which is obvious to himself, on trying to return to duty. This want of mental control, and the frequent story of feeling all right one day, and "rotten" the next, may be taken as evidence of a lowered threshold

of psychological stimulation. This same diminution of inhibition is seen in the increased excitability of the deep reflexes, often of the superficial reflexes also. In other words, we observe the reaction of the man to mental and mechanical stimuli is excessive.

It is only necessary for me to indicate the main features of the involuntary neuro-muscular mechanism in order that we may see that it is a reflex system in the widest sense of the term. It is not possible to go into detailed description of this regulating mechanism, but let me remind you of some of the operations which it controls.

(1) The regional distribution of the blood supply, and the reflex maintenance of the body temperature through proper distribution of the circulating fluid. This fact must be borne in mind in the soldier, where the strenuous exertion and heat production are excessive, especially if he is carrying full equipment. Perhaps it is not out of the way to point out how great a part the secretion of sweat must play in this heat loss; and how excessive heat production means more CO_2 to be eliminated. Dyspnœa and sweating are the involuntary result of normal exertion, and we might say a normal reflex.

(2) The reflex movements of the whole alimentary system from the œsophagus to the anus.

(3) The regulation of the blood supply in such a manner as to counteract the effects of the force of gravity, sudden postural change, etc. This is an exceedingly complex proposition from a mechanical point of view.

(4) Many of the reflexes which appear as the result of emotional disturbance come within the province of this involuntary mechanism.

(5) The mechanism of the organs of reproduction.

All these considerations appealed to me when thinking of the tax of active service upon the nervous mechanism of the body. A closer study of the involuntary nervous system as elaboratedby Gaskell [3] allowed me to see even a more detailed reason for the view, that a neurasthenic state was evidenced by the lowered threshold of reflex excitability in the cardio-vascular, the respiratory, and the alimentary systems. The question of the reflex effects of emotion through this involuntary system is as old as the time when the heart was considered to be the seat of the emotions. Clinical medicine is bound to embody much more the consideration of the work of the physiologists in this field, and to-day the study of the results obtained in their investigation of the involuntary nervous system illuminates many conditions we have called neuroses. If the description of Gaskell be followed, we learn to recognize three main parts of the involuntary nervous system.

(1) The cranial portion, mainly composed of fibres in the vagus, which carry involuntary impulses to the heart, lungs, stomach and small intestine. (Cranial outflow.)

(2) The thoracico-lumbar portion (the sympathetic nervous system), which is the path of nervous supply to the heart, the blood-vessels all

over the body, the sphincter system of the intestines and the bladder, the involuntary muscles of the skin connected with the hairs and the sweat glands, etc.

(3) The pelvic portion, which is mainly concerned with the involuntary impulses going to the large intestine, bladder, and the organs of generation.

I do not intend to elaborate the details of this reflex mechanism further, but it is necessary to mention the close association of the part called the thoracico-lumbar portion with the function of the adrenals. Physiologists have shown that the secretion of these glands, i.e., adrenalin, when injected into the circulation of an animal, produces the same effect as stimulation of this nervous mechanism. No such effect is produced on the vagal or pelvic portions by this secretion. It may not be out of place to note at this point the work of Cannon, which demonstrated that in animals subjected to severe emotional stress, there was a definite increase of the amount of adrenalin found in the circulation. The difficult fact to grasp is, that an emotional state must now be associated with a definite physical change in the body, which change includes an increased amount of adrenal secretions in the blood correlated with a stimulation of the involuntary nervous system. These views of Gaskell may or may not stand completely, but I think any clinician reading them will find a new light on symptomatology of disease. The knowledge of the intricate reflex mechanism of the body, which is beyond our control, will aid in the solution of the problem which so-called functional disorders present. Let me say, in concluding this introduction to the consideration of etiology and symptoms of "irritable heart," that the term involuntary indicates sufficiently that these reflexes cannot be called forth at will by the individual. There are some people who can increase the frequency of the pulse voluntarily, but they are most exceptionally gifted. I have never heard of any person who could voluntarily produce a condition of "goose-skin"—a pilo-motor reflex—or by volition produce sweating, or develop cyanosis of the extremities, etc., or exhibit a blood pressure 20 to 30 mm. Hg above the ordinary pressure for the individual.

The exaltation of these involuntary reflexes is as indicative of a condition of alteration in the nervous mechanism of the body as any other evidence we can produce, and that they are involuntary enhances their value as evidence where the question of simulation arises.

Etiology.

In the endeavour to discover the etiological factors which bring about the symptom complex of cardiac irritability, as outlined in the opening description of the paper, I take the view that the condition is the result of a state of "irritable weakness" of the involuntary neuro-muscular mechanism in association with a similar state of psycho-motor and psychic systems. In one word neurasthenia.

This view at once adds to the difficulty of the D.A.H. problem from

many aspects. The discussion of the etiology of neurasthenia is a subject beyond the scope of this paper; but I consider these remarks, made as the result of the examination and treatment of men in whom the neurasthenic symptoms were most evident in the involuntary neuro-muscular system, are applicable to the general condition, neurasthenia. The object I have in view is to present a picture of a neurasthenic state in which the psychic and psycho-motor disturbances may be overshadowed by the evident changes in the involuntary mechanisms of the body, and to put forward the points which seem to throw any light on the genesis of the condition.

Emotion.

Under this head a full discussion of psychic influences upon the body would involve a study of modern psychological conceptions, details of which are not all of practical value in clinical medicine. It will be sufficient for my purpose to repeat again, as an example of influence of mind upon body, the excessive secretion of the adrenals as a demonstrated fact in animals suffering from stress of emotion; or to mention Crile's elaborate technique to minimize the effect of psychic shock during a surgical operation. The stimulus of emotion can hardly ever be absent in health, but in civil life it can be reduced to a minimum. Even with such a reduction, everyday life shows us examples of how differently different individuals react to small stimuli. Take as a contrast the conditions of active service in modern warfare, and it is not difficult to imagine the enormous emotional stimuli which occur; nor is it difficult to foresee the results. The marvel is that the human organism, from a nervous point of view, has resisted this stress as it has done. We are apt to forget that the soldier's profession is, perhaps, the oldest in existence, and that discipline is the weapon which has been forged to combat the effect of these emotional stimuli. The Army is a school of practical psychology. This is very evident when one sees how the soldier is formed from the recruit. The exact point at which the result of an emotional stimulus is to be considered as a pathological effect is impossible of definition; and as a consequence it is hard to state what exactly constitutes a pathological reaction in the involuntary neuro-muscular mechanism. A further difficulty is encountered if we are asked to say whether this low threshold of stimulation is the normal, healthy reaction of the individual, or whether increased emotional response is evidence of a diseased state of the nervous mechanism. It is not necessary to discuss this all-pervading factor of life more fully; sufficient has been said to show how much the psychic element enters into the stress of the soldier's life on active service, and the old physiological law—the summation of stimuli producing a maximum response—has a chance of operating on the healthy or poisoned nervous system. Many writers upon the subject of nervous shock have pointed out the condition which can arise from simply a definite psychic shock, therefore it is to be remembered, when considering the effect of shell explosion producing concussion with uncon-

sciousness, that there must be a large concomitant psychic shock of which there is no conscious memory. When dealing with the question of treatment of these functional disorders, it will be necessary to return to some of these considerations.

Infection.

To enter into this question is to commence a discussion on what my colleague, Major Houston, describes as the greatest problem that clinical medicine has to solve. By this I wish to indicate the difficulty in establishing a proof that an intoxication of the body is arising from a septic focus which we can detect, or which we may suspect exists.

It is a definite fact that we are as yet unable to bring forward any direct evidence that the functional condition "Irritable Heart" is due to a chronic infection, but I will endeavour to state my reasons for considering bacterial toxins as a possible basal factor of the syndrome. The evidence of the history of these men; in a very large number of instances the symptoms occur for the first time during or in convalescence from an infective disease. Similar signs and symptoms may occur in any patient after infection on attempting to return to the normal use of the reflex mechanisms of the body. These symptoms, however, pass off readily in the majority of people. What, therefore, does their persistence in certain individuals mean? Is it the persistence of the toxic effects, or merely the question of a weakened nervous mechanism? These queries cannot be answered in the light of our knowledge to-day, but it is most suggestive that we know of a definite injury to the nervous system—post-infective neuritis—which we attribute to the action of the bacterial toxins in circulation during the infective stage. The possible effect of these toxins on the finest elements of the nervous system, the dendrites and their synapse mechanism, is an alluring assumption in the light of nervous integration.

The next comparative consideration is the incidence of rheumatic infection in connexion with these cardiac disorders. Many points are of interest when reviewed from the standpoint of the cardiac pathology of to-day. Mackenzie's conception of the life-long infectivity of rheumatic virus, with its exacerbations and gradual destruction of the cardiac efficiency, may be well worthy of consideration as a prototype of many chronic infective conditions, against which the body is only able to establish a temporary immunity. It has not been customary to associate functional cardiac disease with rheumatic infection; but in these so-called functional disturbances which are under discussion, a very fair proportion of the men have previously suffered from an attack of rheumatic fever. I do not think that we can neglect the nervous element which is here associated with the possible chronic intoxication of the rheumatic infection. It is of interest to consider also the close connexion which exists between chorea with its nervous symptoms, and rheumatic fever; as in chorea we

have exhibited a distinct disturbance of the psycho-motor and psychic mechanism. It is possible to develop this line of thought still further if we argue that tonsillitis is often found to be associated with irritable heart; here again clinical evidence is strongly in favour of our infective agent being closely related to the rheumatic virus, and neuritis may be associated with tonsillitis.

It must be remembered that the most careful examination of all these patients revealed no evidence whatever of the presence of any organic heart disease, myocardial, or endocardial; hence it appears necessary to seek some other source of circulatory inefficiency than the heart. On general grounds it may be said we appreciate fully the neurasthenic state of the psycho-motor and psychic systems which arise so constantly as a sequel to an infection; and that it is not a huge assumption to take it that the involuntary neuro-muscular mechanism is likely to be found in a similar state.

Trauma.

Many of the men gave a history, dating the onset of their symptoms from shock associated with a shell explosion, or following recovery from a wound. Here, of course, the first two factors above may be in operation, i.e., emotional shock and infection. It is well known that the sensations which immediately precede unconsciousness are completely forgotten; but it is hard, when we consider the rapidity of thought, to believe there is not an enormous psychic stimulation before this temporary dissolution. Clinically, the picture of the soldier, in whom the diagnosis of traumatic neurasthenia is as correct as that of "Irritable Heart," resembles very closely some of the cases seen in civil practice after accidents.

Gassing.

This may also be considered in the light of psychic shock, or as post infective, since the second stage of the lung condition in these men was undoubtedly an added infection to the primary destruction of the lung tissue.

Hyperthyroidism.

The possibility of a condition of hyperthyroidism was carefully considered, but the evidence was quite inconclusive, in spite of the fact that the soldier on active service is apt to develop an enlarged thyroid. If an argument of the legal type may be used one might say, even if it is due to hyperthyroidism, the latest work of M'Carrison would associate Graves's disease with toxic absorption as the primary cause.

Before leaving this question of etiology, there are many points which will bear mentioning. As already pointed out, in about a third of the men who suffer from this incapacity, we can demonstrate some organic disease which we are accustomed to associate with the idea of toxic absorption. Then again, it was remarkable in a considerable number of these men,

to note the evidence of past disease and possibly severe intoxication which their deformed chests afforded.

The question of the possibility of these men "doping" themselves must always be considered; but I feel satisfied that this is a very rare occurrence, and any of the vaso-dilator group, such as the nitrites, would produce a different clinical picture. Then the constant association of tobacco with cardiac derangements in civil life naturally makes one think of it as an etiological factor. That it accentuates the symptoms is evident [4], but that it is not the cause of the condition is certain by the quite moderate number of non-smokers who are afflicted by this incapacity. It is very often asserted that the condition is due to aberrant sexual conditions; but here again there is no direct evidence, and if such conditions are present I should think they are associated in some way with the pelvic portion of the involuntary neuro-muscular mechanism, and a symptom of a lowered threshold stimulus, rather than a cause of the syndrome.

To sum up these considerations of the possible etiological factors involved in the functional disorders described under the terms "Irritable Heart," "Soldier's Heart," "Cardiac Irritability," etc., it might be said that this syndrome is evidence of a lowered threshold of stimulation in the involuntary neuro-muscular mechanism. In discussing the origin of this lowered threshold of stimulation, two factors, emotion and intoxication, seem to be the agents at work. Add to this the consideration that each individual has in all probability a response characteristic for himself to these two factors; and so, as it were, is in his normal condition placed close to, or far from, the boundary that separates a healthy state from neurasthenia. Thus, an exaggerated emotional disposition, an intolerance of a specific toxin, or any toxic effect, may be the basis of the irritable weakness of the nervous system which we call neurasthenia. The idea that a stimulus constantly repeated may, under apparently healthy conditions, break down the mechanism opposed to it, can be used also to assist in the explanation of the origin of this debilitated state of the psychic, the psycho-motor, and the involuntary nervous mechanism of the neurasthenic soldier.

Symptoms and Signs.

I have very little to add to the clinical description of the symptoms and signs which are associated with this "irritable heart condition," and which have been so fully set out in the works cited above. I shall rather endeavour to associate these clinical observations with a disordered action of the involuntary neuro-muscular mechanism.

Pain.

The patients' description of this common symptom is very varied; thus the sensation complained of may be—a stabbing pain, a pain like the sticking of a needle, a bursting feeling, true anginoid pain, crushing, etc.,

with extension of the sensation of pain down the left arm. These præcordial sensations are often associated with hyperalgia of the left side of the thorax. In many men we noted a tenderness on moderate pressure in the fifth or sixth left intercostal spaces, extending from the axilla to the sternum, i.e., below the heart, and segmentally not an area to which true cardiac pain is usually referred.

We do not know the exact condition of heart and blood vessels at the moment of an attack of true angina, but we do know that emotion and effort are often the cause of its onset. Further evidence of associated strain in the involuntary neuro-muscular mechanism may be adduced from the fact that sudden exposure to cold may be the cause of onset of "breast pang"; also we know how intimate is the connexion of many attacks with a distended atonic condition of the alimentary canal. It has been usual to consider that this true anginal pain is most probably associated with coronary sclerosis, and during the attacks a relative ischæmia of the cardiac muscle. It is interesting to note that in these young men, with an apparently healthy myocardium, who suffer from cardiac pain, this pain is associated with an over-action of sympathetic portion of the involuntary nervous system. This over-action is expressed as excessive tone of the cardiac muscle, and it has often struck me that as a descriptive term "cardiac colic" would convey a theoretical explanation of the associated pain, and, perhaps, rob the man of some of the distressing emotions it causes.

Palpitation.

The soldier generally characterizes this as a throbbing, and refers it to the præcordia, or often speaks of it as in the neck or head. A rapid beating or fluttering is the usual description, but it is quite a common statement that at times the heart seems to get gradually slower and slower, as if it would stop. The sensation of the extra-systole, the feeling of heart stumbling or turning over has been often described. In a very few instances the attack was of the type of paroxysmal tachycardia, but, as a rule, there was simply an acceleration of the pulse frequency by a shortening of the diastolic period of the cardiac cycle as shown in the electro-cardiograms. These cardiac sensations are of great interest, as in the normal individual the sympathetic acceleration or vagal slowing passes unnoticed, or, if noticed, is easily accounted for by the circumstances which produce it.

Dyspnœa.

This symptom is, perhaps, the one which the man most often states is his principal disability on exertion. It is better described as a sensation of dyspnœa. Many speak of it as a choking or a catching in the throat, with a feeling of the impossibility to get a breath. When seen in this condition, the usual appearance is of a man who is breathing rapidly with small respiratory excursion of the thorax, and no degree of cyanosis to warrant the assumption that there is any deficiency of oxygenation present. I had

one man who developed this dyspnœa with syncopal feelings while he was being cardiographed, and there developed coincidently an acute emphysematous condition of the lungs with asthmatic wheezing all over the chest. The general attack was similar to the ordinary hysterical faint so commonly seen in hospital externs in young women. The cardiogram simply showed an ordinary tachycardia. There was profuse sweating, the pupils were dilated, and the whole condition passed off rapidly on a severe admonition. Undoubtedly some of the men who arrived carrying full equipment showed on arrival an emphysematous condition of the lungs, which passed off rapidly. By this I mean there was evident temporary distension of the lung, as on forced expiration, i.e., coughing, the areas of cardiac and hepatic dullness being diminished. This slight distension passed off while the patient waited, say in half an hour.

The most interesting work which has been done in connexion with this question of dyspnœa has been carried out by Lewis, Barcroft, and others, assisted by Professor T. H. Milroy. The members of this Society appreciate the work of Professor Milroy through the papers he has read before it; these contributions have made us familiar with the electrometric method of estimating minute variations in the reactions of the blood reckoned in free hydrogen ion concentration, i.e., absolute acidity. We had learnt to recognize the fact that the respiratory stimulus for increased breathing action was accompanied by an increased absolute acidity of the blood due to the increased CO_2 in the blood; this increased free hydrogen ion concentration being the probable stimulus to the nerve cells in the respiratory nerve centre. To put this in a simple way, we might say that the normal result of effort produces a slight acidosis (a relative reduction of blood alkalinity) which is the stimulus for the increased respiratory effort. The result of this work on "soldier's heart" was of extraordinary interest. It appears, that owing to a diminution of reserve alkali, the blood of these men, who show a dyspnœa out of proportion to the effort exerted, is acidified more easily by the action of CO_2 than the blood of a normal person. The fact that the blood of these men who exhibit a general instability of the nervous system, i.e., neurasthenia, should show an instability to an acid intoxication of normal amount of CO_2, and a correlated increased respiratory response to effort is most suggestive. The work at the Military Hospital, Hampstead, would go to prove there is an excessive change of the blood reaction to the normal amount of CO_2 which effort produces, i.e., we have a physical basis for the excessive nervous reaction in the respiratory system, in other words, a chemical explanation of the intolerance of the neurasthenic to the normal acid intoxication which effort produces.

Vertigo.

This is a very common symptom, and is probably associated with defective action of the cerebral blood supply and the semicircular canal mechanism. The careful study of this sensation did not elicit any very

conclusive opinions as to its causation, but it often appeared to be closely related to the type of giddiness which we are inclined to regard as reflexly connected with the alimentary canal.

Fainting.

I have only seen one true faint, and that was seen while the patient, a non-commissioned officer, was actually being cardiographed. The cardiogram showed an increasing bradycardia, with disappearance of the auricular complex—a typical vagal overaction. I saw several faints in which the man had not lost consciousness, and which were similar to the ordinary hysterical fainting fit. No doubt the condition of the abdominal musculature of many of these men was such as would readily allow of the faint being accompanied by the lagging of blood in the abdominal cavity, and I was struck with the fact of the great abdominal support the kilt afforded when considering this possible cause of fainting. On final consideration I was disposed to think that this abdominal distension, so common in these men, was simply an expression of the general want of muscular tone rather than the cause of any of their symptoms.

Sweating.

This was a remarkable feature in some men, and most of them complained of excessive sweating on exertion. On a cold morning I saw one man's hands which were blue and cyanosed, simply steaming, which showed in his case the secretion of sweat was not associated with vascular dilatation. The secretion of sweat would seem to me to be the overaction of a portion of the involuntary mechanism which regulates the heat loss.

Sensation of Exhaustion.

This is so common as to be almost a source of amusement to those who have to deal with these men. The constant vigilance required to keep them out of bed is a demand upon the temper of the sisters and orderlies. The picture of a healthy, strong-looking man who takes to his bed on the very least provocation is very apt to excite derision and contempt amongst those attending upon wounded soldiers; but the "heart case" is often oblivious to these surroundings, the sensation of exhaustion dominates him.

Insomnia is often present in these patients, but if one were to rely on impressions, the men complained much more of this when we had them in hospital than when they were treated as routine convalescent camp patients. Undoubtedly quite a number of these men suffered from headache, but it did not give one the impression of being of an excessively severe type.

Many other symptoms would bear close analysis, but they are not of the relatively simple type which have been discussed above. I would, however, remark that they are very common complaints of everyday life,

and that the general practitioner recognizes their association with what he often calls a nervous breakdown.

Signs.

It has already been remarked that almost all that can be accomplished by a clinical examination in these cases is to note the absence of any organic disease. The many signs of circulatory disturbance may now be discussed, and I think it is again advisable to remember that the heart is only a portion of the circulatory system. At the risk of being perhaps too elementary, I will remind you that the heart is the pump, but the arterial system is a reservoir of variable capacity, and in which the pressure is dependent not only upon the force of the heart muscle, but also on the condition of the arterioles, i.e., the diminished size of the arterial reservoir is usually associated with a rise of pressure. In the healthy state the circulation is maintained by correct balancing of force of heart muscle, size of the arterial reservoir, and pressure in this reservoir. This balancing is accomplished by the involuntary nervous mechanism through the apparently opposing actions of the vagus (the cranial outflow) and the accelerator sympathetic (the thoracico-lumbar outflow). The efficiency of the circulatory apparatus, therefore, depends upon correct co-ordination of these involuntary nervous impulses, just as all our voluntary muscular actions depend on the proper co-ordination of the voluntary nervous impulses to opposing muscles. In the following description of the signs of circulatory disturbance, I shall endeavour to keep constantly before your minds the view that a failure of circulation may be simply a failure of nervous co-ordination, and not necessarily an incompetence of the heart muscle. The immense importance of this nervous element in circulatory failure was not clear to me in the earlier part of my investigations, and I was very disappointed to find that the electro-cardiograph apparently would throw no light on the problem, as all the myocardial records pointed to a normal, healthy type of muscular contraction. It was only after seeing many of these hearts by means of X-ray examination to be of normal size, or often slightly smaller than normal, that I finally concluded that the clinical evidence of the presence of a normal heart muscle was overwhelming.

Tachycardia.

The most obvious sign, as a rule, is tachycardia, and one could, of course, spend endless time on the description of this marked feature of the syndrome. The main points of interest are, that the increased pulse rate is very evident in response to emotion or effort. The change of rate which accompanies the change of posture is to my mind a most important reflex of the involuntary mechanism. I cannot think that emotion plays much part in this reflex, where the pulse shows a persistent tachycardia as a result of change from the recumbent to the standing position. In all the men we examined we took the pulse-rate at the end of a standard

amount of exertion, and after a two minutes' rest. I did not feel, however, that there was any certainty of excluding the effect of emotion reflexly elevating the pulse rate. In all the men so examined, it was very evident the man considered our decision was a very fateful one for him, as it involved his return "up the line" or a sojourn at the base. I have seen many instances of this decision settling the pulse irrespective of whether it was favourable to the man's hopes or not. Some few men suffer from attacks of paroxysmal tachycardia, but I was only able to prove its existence in two cases, although 3,000 cardiograms were taken.

The Heart.

In many of these men, the moment they strip the excitability of the heart is obvious on simple inspection. There is seen a flashing wavelike contraction running from the left side of the sternum over the præcordia, and there is often epigastric and carotid pulsation. The man may be holding the thorax close to the expiratory position, and the broad impulse or cardiac wave disappears on deep inspiration. This is easily seen on the X-ray screen to be associated with a considerable diaphragmatic movement. On palpation the impulse is more jerky and forcible than heaving. It is very extraordinary how great the difficulty is of locating the left margin of the heart in many of these men. It was surprising how often, where we thought the heart was enlarged, the screen examination showed the heart to be of normal size, in some cases slightly smaller than normal, while in others the heart showed a very marked change of shape with the phases of respiration. I cannot pass without remarking again upon this apparent enlargement of the heart, and the observed fact that it may be smaller than normal. This slight diminution of size I would consider as evidence of an increased thoracico-lumbar affect associated with the increased vascular tone. I have undoubtedly seen some men in whom there was a slight cardiac dilatation, but there was, as a rule, some slight febrile state associated with the cardiac distension. I cannot help thinking that in many cases the extent of the visible pulsation leads to the diagnosis of acute dilatation, when the heart is even smaller than normal, and the pulsation is simply a conducted one, such as is often seen in a person with irritable aorta. Determination of the size of the heart by percussion in many of these men is also difficult, as the tactile sense is disturbed by the pulsation. In endeavouring to limit this error as much as possible, I found orthopercussion of the most service. It is with these facts in view that I feel the greatest care must be taken before the statement is made that any of these patients suffer from even temporary dilatation. The next consideration is that of the auscultation signs. These are very varied, but one of the most common changes is a peculiar loud first sound at the apex. There are systolic murmurs of innumerable types to be heard in these hearts. They are indeed varied, and in the same heart the murmur comes and goes in an inexplicable manner. I used often to compare these

murmurs to the physical signs heard over a tubercular focus in the lungs, both seemed to vary so much from week to week. It has occasionally been my experience to send a man into hospital, thinking that he had mitral reflux, and the following day in hospital consider the heart was normal. The whole examination of the cardiac condition of these men seems surrounded by pitfalls. I think it is to be best attacked by taking into account the question of the cardiac tone as maintained by the balanced action of the vagus and thoracico-lumbar portions of the involuntary nervous system. The heart is not a fixed size, and its size can be increased by stimulation of the vagus. I do not know of any experimental evidence of the diminished size through sympathetic stimulation, but it is diminished in normal men after severe exertion. In practically every one of these men the cardiogram was of a normal type. There was no evidences of left ventricular preponderance, on the other hand the "R" wave was often prominent in Lead 111, while the "T" wave in this same lead was equally often inverted.

Vaso-Motor.

The blood pressure is usually somewhat above the normal, often between 140 and 160 mm. Hg systolic, and 80 and 90 mm. Hg diastolic in many cases. The radial artery wall was, as a rule, so distinctly palpable as to be considered in a condition of increased muscular contraction. The hands were often markedly cyanosed, and even the condition of "dead fingers" was a common complaint. There was often a marked "tache cérébrale," and in one or two men wheals could be produced by simply sharply stroking the skin with a pencil, or slight nipping had the same effect. This, I take it, is merely evidence of vaso-motor instability.

The Lungs.

A considerable number of these men were quite unable voluntarily to breathe deeply. This is very commonly noted in the civilian, but it appeared in these men to be a decided handicap. The chest was often held in the expiratory position, and although the expansion was normal, the man usually breathed with a very shallow excursion. Quite a number of these functional cases had deformed chests of various types. I felt that the deficient respiration was in many cases as much a part of their incapacity as was their circulatory disturbance.

The Alimentary Tract.

In considering the results of the examination of the alimentary system two factors were especially taken note of, namely, the presence of any evidence of a septic focus or possibility of septic intoxication, and the condition of nervous tone of the abdominal viscera. The examination of the mouth showed in very many men that the teeth might be taken as a source of septic intoxication. Many of these patients with neurasthenic

signs had a general pyorrhœa, and although its presence may not be proof of intoxication, yet it is definite evidence that the virus causing the infection has gained a foothold upon a soil which is not able to throw it off. That an intoxication must be present seems to be undoubted, but whether it gives rise to symptoms or not seems to be a question of tolerance of the individual. The same reasoning is applicable to the tonsils. Here it is often to be noted that there is a chronic enlargement with or without suppuration in the crypts. The condition of the bowels was inquired into, and in many of these men some slight derangement of function was noted. Quite a number of these men had been operated on for appendicitis.

I have already mentioned a striking feature was the want of tone in the abdominal muscles which was often associated with a similar atonic state of the stomach and intestines. There was in some of these men definite clapotage and apparent gastric distension. In fact the want of visceral tone made me wonder if the pain in some of the patients was not abdominal in origin. I considered this want of tone as further evidence of the vagal insufficiency in the involuntary nervous balance. The closest approximation to a description of the abdominal condition of these men would be vagal atony.

The Thyroid Gland.

The presence of an enlarged thyroid in a soldier on active service is of fairly common occurrence, yet Graves's disease is comparatively rare. Of 1,200 cardiac examinations, roughly a quarter of the men showed an enlargement of the thyroid, whilst it could be said only about four per cent of the total men examined suffered from exophthalmic goitre. The clinical picture produced by hyperthyroidism, with its attendant over-action of the sympathetic portion of the involuntary nervous system and concomitant increased adrenal secretion, has so many features in common with the picture presented by this "irritable heart condition," that it is difficult to draw a sharp line of demarcation between them. This similarity has led to the expression of the opinion that the conditions are one and the same, but I would dissent from this view for many reasons. I think the lowered threshold of stimulation to nervous impulse is the factor in common, and cannot believe that the assumption of a hypersecretion of the thyroid is necessary to explain the increased excitability.

The Nervous System.

So much has been said in the opening part of this article with regard to the condition of the nervous system in the patients, that I shall merely indicate a few other considerations which occur to me as of interest. In all these men we made a routine examination of the various reflexes—conjunctival, pharyngeal, abdominal, cremasteric, plantar, jaw-jerk, triceps-jerk, supinator-jerk, knee-jerk, and ankle-jerk. Occasionally the visual fields were roughly estimated as to their extent. As already stated,

the bulk of the men so examined showed a neurasthenic state associated with the "irritable heart condition." One of the signs noted as existing in these men was a marked general tremor, and especially on stripping for examination, although the men constantly denied feeling cold. I have not the least doubt that this tremor was involuntary in the vast majority of these patients, although when dealing with them it was difficult to restrain a contemptuous feeling unless, as often was the case, the man's scars rebuked such a feeling.

We examined, as a routine, each patient for the eye signs, which are usually associated with Graves's disease, and found that in men in whom we did not think there was hyperthyroidism present, we obtained Stelweg's sign, or Von Graefe's sign, or both. Often we noted a marked widening of the palpebral fissure on attempted convergence. These signs occurred most often in men who were markedly neurasthenic.

The Genito-urinary System.

We made an examination of the urine for albumin in each man. The object was to exclude nephritis, as we met a few cases who complained of the "irritable heart condition," and whose urine was loaded with albumin. The test is necessary before putting these men on exercise. A few of these men complained of increased frequency of micturition, but I only remember one man with definite incontinence of urine. This is a point of interest in connexion with the bladder innervation.

Treatment.

During the first year of my work overseas my experience was confined to attempting to treat these patients in hospital. It was, of course, impossible to keep many of these men in the hospital for a longer period than three weeks, and my experience in the use of drugs was most disheartening. We tried digitalis, the various cardiac tonics, vaccines and sedatives. I thought that the action of potassium bromide was the most marked, and this was before I had come to look upon the condition as mainly a nervous manifestation. However, it was quite evident from a practical point of view that these men could not be recovered as fit for active service by hospital treatment. It was then decided to try treatment by graduated exercise on the scheme which had been used at the Military Hospital at Hampstead. At the outset we commenced drilling these men while they were hospital patients, but after a short experience decided that the hospital atmosphere was not suitable, as there was very a distinct possibility in the patient's mind of his failure to improve, meaning evacuation to England. The next stage was that all suitable D.A.H. cases were sent to the Convalescent Depot from the hospitals of the district. Captain A. V. Poyser, R.A.M.C., took charge of the treatment, and it is entirely due to his efforts that our scheme worked without the slightest hitch, and

that we were able to take good clinical notes of the condition of each man, at the start of the course, half way through, and at the end of the treatment. When we had treated and disposed of about 1,000 men, Captain Poyser wrote a thesis upon our results, which I hope he may be able to publish.

It was during my association with the Convalescent Depot that I learnt to appreciate so fully the fact that the Army is a school of practical psychology, where discipline is the basis of the curriculum which produces our magnificent British troops. I had always thought of this course of treatment by graduated exercise as very similar to Patterson's treatment of sanatoria patients by graduated labour, and conceived the idea that the benefit resulted mainly from auto-inoculation. I confess after seeing the treatment carried out in a convalescent depot I realized more fully the importance of atmosphere. I learnt to understand, from the efforts of those who were in charge of this branch of medical treatment of soldiers, how much the psychological element plays in the life of the soldier, and how his natural sporting instinct is manipulated by great therapeutic skill. Thus the whole course of the treatment by physical drill was enlivened by games of increasing degree of strenuousness. I was constantly told that my D.A.H. patients were the nippiest lot in the camp when at these games. The personality of the instructors was another feature. Our serjeant-major seemed to me to handle these men with the greatest tact. On several occasions this instructor remarked that some of the men were over keen at the games, and that they appeared excessively exhausted after the excitement was over. The treatment may therefore be looked upon as simply consisting of possibly auto-inoculation and gentle army "schooling." At the end of this course we examined each man rapidly, dismissed him, read over the clinical notes which we had taken, and decided his fate, i.e., active or base. Many of these men were remarkably improved, but the excitement of this final "strafe" made them often seem worse than when half way through the final course. It was my final opinion that the man had had a good test of his capacity of endurance by the course, and that it was not possible by clinical means to decide what was his total capacity in this respect. In other words, the final test of application of active service conditions must be the criterion, and we had reduced the possibility of any injury to the man to a minimum. It may not be out of place to remark, as a final observation, how much I thought these men were affected by conditions of the weather. I can best illustrate this by citing the fact that on successive days we had a series of thunderstorms, and the men examined all, to my mind, showed an excessive amount of cardiac irritability, so much so that I felt inclined to call them a lot of barometers, without at the time realizing how much the atmospheric conditions must strain their involuntary neuro-muscular reflex mechanisms.

Prognosis.

As already indicated, a considerable number of these men were marked as fit for a trial of active service after the course of treatment. The majority of the remainder were marked as suitable for base work, where the strain to be endured came within their limited capacity of endurance. The ultimate prognosis, however, always struck me as best based upon our knowledge of the usual course of neurasthenia in civil practice.

In conclusion, I will again state the opinion that the problem of dealing with these men whilst they are still in the Army is a simple one compared to the question of their treatment when the Army has discarded them and they must return to civil life. It is to aid, if possible, in the solution of this problem that I have placed my view of the clinical side of the "soldier's heart" before you. This view I would reiterate is the result of the experience gained at a base overseas, and the few cases that I have already seen at home make me realize anew the complexity of the problem. I went abroad armed with an electrocardiograph, and the conviction that the "irritable heart condition" was a manifestation of cardiac disease, and I have come back obsessed with the idea that the syndrome is merely part of a general nervous disorganization which we have designated neurasthenia. Further, if it is possible from the study of this syndrome as a particular to infer the characteristic of neurasthenia as universal, I would consider the fundamental of this derangement of nervous integration as an increased reaction of the nervous system of the individual to an intoxication, which intoxication may be subliminal as regards the occurrence of symptoms and signs in the normal individual.

I wish to express my appreciation of the help which I received from Captain A. Brunwin, R.A.M.C., and Captain A. V. Poyser, R.A.M.C., during this investigation. It was through the influence of Colonel Sir John Rose Bradford, K.C.M.G., the Consultant Physician for the Administrative Area, that the opportunity to carry out this investigation was obtained. Lieutenant-Colonel C. Trimble, C.M.G., V.D., commanding the St. John Ambulance Brigade Hospital, established a Cardiac Department in the Hospital, and made our work possible by granting every facility we desired.

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NOTES ON SIXTEEN CASES OF BLACKWATER FEVER OCCURRING IN MALTA.

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The following notes are founded on sixteen cases of blackwater fever which occurred during the months October, 1916, to April, 1917 (inclusive). The patients were soldiers who had been invalided during the preceding five months from Macedonia, where malaria and blackwater fever are endemic, to hospitals at Malta, where blackwater fever was not known to have occurred and where malarial infection does not take place owing to the absence of anopheles. Fifteen of the cases were first attacks, the sixteenth was a second attack of blackwater fever occurring in Malta three months after the first, which occurred in the malarial district above mentioned.

We are personally responsible for the greater part of the laboratory examinations and are indebted to the medical officers in charge of the cases for permission to make use of the clinical notes.

Since the causation and pathology are at present uncertain it is necessary to define blackwater fever as a clinical syndrome.

Essential conditions are that the patient must have resided in a malarial district for at least some months and probably have had repeated attacks of malaria, these conditions were fulfilled in all our cases.

The symptoms which are invariably present are hæmoglobinuria, fever, and a high degree of anæmia, appearing very early and increasing rapidly during the attack, and prostration. Some degree of jaundice and vomiting are almost constant symptoms and in our cases were only absent in Case 16, which was a mild second attack. Enlargement and tenderness of the spleen and liver are commonly present and often increase during the attack. There may be a considerable degree of abdominal pain, generally referred to the epigastrium or hypogastrium.

It is possible that two or three distinct diseases are grouped under the name of blackwater fever. However, a perusal of the cases recorded by Christophers and Bentley [1] and by Barratt and Yorke [2], and in the British Government reports on blackwater fever in tropical Africa for 1912 [3] and 1913 [4], leads us to the conclusion that the cases occurring in the tropics cannot be differentiated clinically from those which we have observed in Malta.

TABLE I.

No. of case	Name	1st or 2nd attack of Blackwater fever	Date of onset of hæmoglobinuria	Interval between onset of Blackwater fever and: Arrival in malarial district	Interval between onset of Blackwater fever and: First attack of malaria	Interval between onset of Blackwater fever and: Arrival in non-malarial country	History of quinine treatment before onset of Blackwater fever	Species of malaria parasite	Date when parasite found	Examination for parasites during attack	Result
				Months	Months	Months					
1	Mc. ..	1st	10.10.16	—	1·6 (50 days)	1·4 (42 days)	Last 17 days, quin. sulph., gr. x, often vomited ; 9.10.16, quin. hydr., gr. x	P.f.R.	8.9.16 and 9.9.16	Negative	R.
2	Ja. ..	1st	23.12.16	12	5	1	Quinine continuously since onset of malaria	?	?	Negative	R.
3	C. ..	1st	25.12.16	11	5	2	?	?	?	Negative	R.
4	T. ..	1st	23.1.17	15	5	4	?	P.f.	Aug., 1916	Negative	R.
5	K. ..	1st	24.1.17	11	4	3	15.1.17 to 21.1.17, none ; 22.1.17, quin. sulph., gr. xxx ; 23.1.17, quin. sulph., gr. lx ; 24.1.17, quin. sulph., gr. lx	P.f.C.	22.1.17	Negative	R.
6	Ma. ..	1st	10.2.17	--	5·5	2	4.12.16 to 3.1.17, quin. sulph., gr. xxx ; 4.1.17 to 17.1.17, quin. sulph., gr. xx ; 18.1.17 to 25.1.17, quin. sulph., gr. x ; 26.1.17 to 9.2.17, quin. sulph., gr. xxx	P.f.R.C.	6.1.17	Negative	R.
7	R. ..	1st	11.2.17	16	4	3	Quinine continuously since September, 1916 ; 1.2.17 to 9.2.17, quin. sulph., gr. x ; 10.2.17 and 11.2.17. quin. sulph., gr. xv	P.f.R.C.	31.1.17 ; 1.2.17 ; 7.2.17 ; 1.4.17	Negative	R.
8	He. ..	1st	13.2.17	8	4	3	20.1.17 to 11.2.17, none ; 12.2.17 and 13.2.17, quin. sulph., gr. v	P.f.R.	21.1.17	Negative	R.
9	S. ..	1st	27.2.17	18	5·75 (or 6 years)	5·5	10.2.17 to 24.2.17. none ; 24.2.17 to 27.2.17 (incl.), quin. sulph., gr. xxx	P.f.R.C.	27.2.17	Positive, 27.2.17, P.f.R.C.	R.
10	Hay...	1st	2.3.17	15	5·5	2	5.2.17 to 23.2.17, quin. hydro., gr. xx ; 24.2.17 and 25.2.17, none ; 26.2.17 to 1.3.17, quin. hydro., gr. xx	P.f.R.	18.1.17 ; 25.2.17 ; 2.3.17 ; 3.3.17	Positive, 2.3.17 and 3.3.17	R.
11	G. ..	1st	7.3.17	?	4·5	3·3	From (?) to 28.2.17, quin. sulph., gr. xv ; 1.3.17, none ; 2.3.17 to 4.3.17, quin. bih., gr. xv i.m., and quin. sulph., gr. xv p.o. ; 5.3.17 and 6.3.17, quin. sulph., gr. xxx ; 7.3.17, quin. bih., gr. xv, i.m., and quin. sulph., gr. x, p.o.	P.v. and P.f.R.	1.3.17 ; 2.3.17 ; 3.3.17 ; 4.3.17, P.v. ; 13.11.16, P.f.R.	Negative	D., 14.3.17
12	W. ..	1st	22.3.17	?	8	5	Quinine since July, 1916	P.f.R.	22.3.17	Positive, 22.3.17, P.f.R.	D., 27.3.17
13	Jo. ..	1st	7.3.17	7·5	5·5	2	2.1.17 to 7.3.17, quin. gr. x to gr. xx	P.f.R.	21.1.17	Negative	R.
14	D. ..	1st	1.4.17	16	5·5 (or 10 years)	4·5	Quinine regularly ; latterly one dose daily till onset	P.v.	28.4.17	Negative	R.
15	Y. ..	1st	4.4.17	?	8·5	4	Quinine, none for 1 week immediately before onset	?		Negative	D., 8.4.17
16	Had...	1st	18.1.17	7	5	0	?	P.v.	?	?	—
		2nd	14.4.17	—	—	1·75	Quinine sulph. for 6 weeks, gr. v ; 12.4.17 and 13.4.17, quin. sulph.. gr. xxx	--	—	Negative	R.

TABLE II.

No. Name Age	Onset of illness	First observation of hæmoglobinuria	Duration of hæmoglobinuria. Quantity in 24 hours	Fever	Jaundice	Vomiting	Pain	Spleen	Liver	Hæmoglobin and red blood corpuscles in blood	Complications	Quinine treatment and saline	Result
(1) Me. 22	9.10.16, T. 103° F.; ill, vomiting	10.10.16, 4 p.m., porter-coloured	12 hours 20 oz. in 12 hours	3 days, T. 103°—100° F.	+ 2 days or more	+++ 2 to 3 days	+ Abdomen	++	..	..	..	9.10.16, quin. hydr. gr. xxx, p.o.; 10.10.16, 8 p.m., gr. x i.m. Rectal saline, 4-hourly	R.
(2) Ja. 21	23.12.16, early morning rigor, T. 103° F.; diarrhœa	23.12.16, 10 a.m., "café noir"	2½ days 40 oz. to 70 oz.	13 days, T. 104·5°—99·8° F.	++ 1 week or more	+++ 3 days.	++ Hypogastrium	+++	—	2.1.17, hgb. 16%, r.b.c. 0·89 M.	..	23.12.16., quin. bih. gr. x, i.m. ,, ,, sulph. gr. x p.o. 28.12.16—4.1.17, quin. bih. gr. xv, i.m. 24.12.16, noon, saline 30 oz., i.v.; 9 p.m. 60 oz., i.v. 26.12.13, rectal saline 8 oz., b. d.	R.
(3) C. 25	24.12.16, rigor, T. 101° F.	25.12.16, afternoon very dark, porter-coloured	4 days 73 oz. to 42 oz.	5 days, T. 103·3°—99·8° F.	++ 9 days	+++ 6 days	Hypogastrium	+	..	2.1.17, hb. 28%, r.b.c. 1·5 M.	..	27.12.16, quin. bih. gr. xv, i.m. 28—29.12.16, quin. bih. gr. x, i.v. 30.12.16, quin. bih. gr. xv, i.m. 27—29.12.16, rectal saline 10 oz. 28 & 29.12.16, saline 40 oz., i.v.	R.
(4) T. 22	23.1.17, T. 103°—105°F.	23.1.17, very dark, porter-coloured	3½ days 63 oz. to 56 oz.	6 days, T. 105°—100° F.	+	+++ 3 days	..	+	++ Very tender	..	..	23.1.17, quin. bih. gr. vii, i.m. 24.1.17 ,, ,, gr. x, i.m. 25.1.17 ,, ,, gr. x, i.v. 26.1.17 ,, ,, gr. x, i.m. 27—31.1.17, no quinine 25.1.17, saline 40 oz., i.v. ,, ,, 20 oz. rectal	R.
(5) K. 23	24.1.17, afternoon headache, T. 99° F.	24.1.17, 4 p.m., dark reddish-brown	2½ days 50 oz. to 60 oz.	3 days, T. 101°—99° F.	+ 2 to 3 days	+ 1 day	Splenic region	+	—	..	..	25.1.17—29.1.17, quin. bih. gr. xv, i.m. Rectal saline 20 oz., 4-hourly for 3 days	R.
(6) Ma. 30	9.2.17, 10 a.m., T. 101° F., shivering, vomiting, aching	10.2.17, afternoon, dark reddish-brown	1 day	6 days, T. 103·8°—99° F.	++ 14 days or more	+++ 3 days	Abdomen, upper part: no tenderness	+ Not tender	+ Not tender	15.2.17, hb. 32%, r.b.c. 1·362 M.	..	9.2.17. quin. sulph. gr. xxx, p.o. 10.2.17 ,, ,, gr. x, i.m. 10—13.2.17, saline 10 oz. rectal 4-hourly	R.

(7) R. 20	11.2.17, 3 p.m., slight shivering, headache; 4 p.m., vomiting; 6 p.m., T. 103° F.	11.2.17, 5 p.m., blackish-red	19 hours 8 oz.	2 days, T. 103°—99·6° F.	+	11.2.17 once; 13.2.17 once	Epi-gastrium	+	..	11.2.17 hb. 62 % r.b.c. 3·3 M.	..	12—17.2.17, quin. bih. gr. xv, i.m. 12.2.17, saline, rectal, 20 oz. 13.2.17 ,, ,, 4-hourly 14.2.17 ,, ,, *bis die*	R.
(8) He. 21	13.2.17, 6.30 p.m., T. 104·8° F. rigor; ill	13.2.17, 7 p.m., porter-coloured	28 hours 80 oz.	4 days, T. 105°—99·8 F.	+	+ 3 days	..	+	—	18.2.17 hb. 34 %	..	14.2.17, quin. bih. gr. xv, i.m.	R.
(9) St. 27	27.2.17, 5 a.m., vomited, T. 100° F.	27.2.17, 7 a.m., dark red	3 days 30 oz. to 66 oz.	4 days, T. 103·4° —99·8° F.	++ 3 days	+ 3 days	None	+	+	..	..	27.2.17—16.3.17, quin. bih. gr. xv, i.m. Rectal saline, 4-hourly	R.
(10) Hay. 29	2.3.17, 10 a.m., T. 104° F.	2.3.17, 3 p.m., reddish-brown; 5 p.m., "café noir"	2 days 57 oz. to 86 oz.	2 days, T. 105°—100° F. (22 days, T. 104·6°—100° F.)	++ 5 days	++ 2 days	None	+ tender	+ tender	7.3.17 hb. 26 % r.b.c. 1·656 M.	Cystitis	2 & 3.3.17, quin. bih. gr. xv, i.m. 4.3.17, saline 40 oz., i.v. 2 and 5.3.17, rectal saline, 4-hourly	R.
(11) G. 33	7.3.17, 3 p.m., rigor, T. 103° F.; 4 p.m., vomited	7.3.17, 6 p.m., deep red	4 days; 8.3.17 anuria; 9—13.3.17 1 oz. to 7 oz.	3 days T. 105·4°—100·4° F.	+ till death	+++ 7—13.3.17	In appendix region	+	—	10.3.17 hb. 38 %	Suppression of urine	7.3.17, quin. bih. gr. xv.. i.m. ,, ,, sulph. gr. xv, p.o. 8.3.17 ,, bih. gr. xxx. i.m. 9.3.17 ,, ,, gr. xv, i.m. 10.3.17 ,, ,, gr. xxv, i.v. 11.3.17 ,, ,, gr. xx, i.v. 12.3.17 ,, ,, gr. xv, i.v. 13.3.17 ,, ,, gr. v, i.v. Rectal saline, 4-hourly; subcutaneously or i.v. saline twice daily	D. 14.3.17
(12) W. 26	22.3.17, 2 p.m., rigor; 3.30 p.m., vomited, T. 104·6° F.	22.3.17, 3 p.m. dark urine	3 days 23.3.17 42 oz.; 24.3.17 none; 25.3.17 14 oz. normal colour; 26.3.17 incontinence	6 days T. 105·8°—100·5° F.	+ till death	+ 3 days	None	—	—	25.3.17 hb. 16 %	Partial suppression of urine	22.3.17, quin. bih. gr. xv, i.m. 23.3.17 ,, ,, gr. xx, i.m. 24.3.17 ,, ,, gr. x, i.v. 25—27.3.17 ,, ,, gr. xv, i.m. Rectal saline, 4-hourly 24.3.17, saline 20 oz., i.v. 24.3.17 ,, 30 oz., i.v.	D. 27.3.17

TABLE II.—*Continued.*

No. Name Age	Onset of illness	First observation of hæmoglobinuria	Duration of hæmoglobinuria. Quantity in 24 hours	Fever	Jaundice	Vomiting	Pain	Spleen	Liver	Hæmoglobin and red blood corpuscles in blood	Complications	Quinine treatment and saline	Result
(13) Jo. 23	6.3.17, 7 p.m., shivering, headache, sweating	7.3.17, 8.30 a.m., red	5 days with intermissions 24 to 46 oz.	5 days 103·6°—99·2° F.	+ 3 days	++ 2 days	Headache	++	+	16.3.17, hb. 52%, r.b.c., 3·682 M.	..	7 & 8.3.17, quin. bih. gr. xv, i.m. 10.3.17, quin. hydr. gr. xx, p.o. 11.3.17, quin. bih. gr. xv, i.m. 12.3.17 ,, ,, gr. xv, i.m. Rectal saline, 6-hourly	R.
(14) D. 38	1.4.17, afternoon headache, feverish	1.4.17, afternoon, blackish red	5½ days 52 to 48 oz.	4 days 105° – 102° F.	++ 4 days	+++ 2 or 3 days	None	+++	+	7.4.17, hb. 24%, r.b.c.. 1·376 M.	..	4.4.17., quin. bih. gr. xv, i.m. Rectal saline, 6-hourly	R.
(15) Y. 31	4.4.17, 10 a.m., shivering	4.4.17, no urine; 5.4.17, 7 p.m., dark brown	4 days 3 oz. to none	4 days 104°—107° F.	+++ 5.4.17 till death	++ retching 2 days, 5 & 6.4.17	Abdomen, especially epigastrium	—	+	..	Suppression of urine	4.4.17, quin. sulph. gr. x, p.o. 5.4.17, quin. bih. gr. xx, i.m.; 11 p.m., quin. bih. gr. xx, i.v. 6.4.17, quin. bih. gr. xx, i.v. 7.4.17 ,, ,, ,, ,, 5.4.17, rectal salines, 20 oz. 4-hourly (3 retained); saline 40 oz. i.v. 6.4.17, saline 30 oz., i.v.	D. 8.4.17
(16) Had. 21	1st attack "18.1.17" "rigor," 2nd attack 14.4.17	"18.1.17"	"1 day"	..	..	..	..	..	..	..	"Epistaxis and melæna"	..	..
		14.4.17, 8 a.m.	36 hours 2 attacks with 2 days intervals	1 day 16.4.17 100° F.	None	None	None	++ Slightly tender	+	6.4.17, h.b. 65%,	..	14.4.17, quin. sulph. gr. xxx, p.o. No saline	R.

Summary and Discussion of the Sixteen Cases.

The following description is based entirely on our sixteen cases unless the contrary is definitely stated.

The main features of the attack were much the same in all our cases, except in the three which ended fatally with suppression of urine, and in these there was no sufficient reason for suspecting a different disease.

Details of the most important facts which were common to all our cases are recorded in two tables. Table I deals with the history of the patient before the attack and the nature of the malarial infection. Table II gives some details of the principal symptoms and the facts relating to quinine treatment.

NOTES ON TABLES.

Table I, Cols. 5, 6, and 7.—The intervals recorded are those between (1) the arrival in a malarial country (Macedonia) and the onset of the blackwater fever attack; (2) the first attack of malaria and the onset of blackwater fever; (3) the date of arrival in a non-malarial country (Malta) and the onset of blackwater fever, i.e., the minimum incubation on the assumption that blackwater fever is due to a special infection.

Table I, Col. 6.—Cases 9 and 14 had their first malarial attacks in India six and ten years ago respectively: their first malarial attacks in Macedonia were 5·5 and 5·75 months respectively before the onset of blackwater fever.

Quinine: Quin. hydr. = quinine hydrochloride; quin. bih. = quinine bihydrochloride.

The dose entered means the amount given in twenty-four hours unless otherwise stated, e.g., gr. xxx means gr. x *ter die*.

P.o. = per os; i.m. = intramuscular; i.v. = intravenous.

Malarial Parasites: P.v. = *Plasmodium vivax;* P.f. = *Plasmodium falciparum;* R. = Rings; C. = Crescents, e.g., P.f.R. = *Plasmodium falciparum*, only rings seen, no crescents.

In Cases 4 and 16 the microscopic diagnosis was made at a hospital in Macedonia and we had no opportunity of observing parasites.

Table II.—The date in Col. 2 is that considered to be the date of onset of the blackwater fever attack as shown by general symptoms. The date in Col. 3 is that of the first occasion on which "black water" was observed by the patient or medical officer. In Case 15 the onset of suppression of urine is given as the date of onset of hæmoglobinuria.

Table II, Col. 5.—*Fever:* The temperatures stated are the maximum temperature on the day on which the fever was highest, and on that on which the fever was lowest. Temperatures of 99° F. and below are not entered.

Table II, Col. 6.—*Jaundice:* + means a distinct yellow colour of the conjunctiva and skin, such as is seen not rarely in severe relapsing malaria; ++ means a more decided jaundice, such as may occur in slight "catarrhal jaundice"; +++ means a deep yellow colour which affected all the tissues, post mortem.

Table II, Col. 7.—*Vomiting:* + means vomiting on two or three occasions; +++ means severe continual vomiting.

Table II, Col. 9.—*Spleen:* + = palpable; ++ = two or three inches below costal margin; +++ = almost or quite to level of umbilicus in left nipple line; — = not palpable, no enlargement detected.

Table II, Col. 10.—*Liver:* + = slight enlargement; ++ = felt two or three inches below costal margin in right nipple line; — = no enlargement detected.

Table II, Col. 11.—*Red Blood Corpuscles:* 0·89 M. = 890,000 per cubic millimetre; 1·5 M. = 1,500,000 per cubic millimetre, etc.

R. = recovered; D. = died.

No entry in a column means no observation recorded.

Prodromal Symptoms and Onset.

The onset of hæmoglobinuria usually appears to be sudden, though in some cases the first specimen of dark urine examined was not so dark in colour as that passed a few hours later. Commonly fever, shivering and vomiting precede by one to three hours the passage of porter-coloured urine. Sometimes there may have been similar attacks of fever and shivering on the two or three days preceding the attack and it is occasionally difficult to be sure that the attack did not really start twenty-four or forty-eight hours before the "black" urine was noticed. The prodromal fever and the fever at the actual onset closely resemble malarial attacks. Our observations agree with the remark of Christophers and Bentley, that neither the patient nor the medical man can distinguish the symptoms ushering in blackwater fever from an attack of malaria.

In three of our cases (Nos. 9, 10 and 12) the malarial parasites (*Plasmodium falciparum*, rings) were found in the blood a few hours after the first appearance of hæmoglobinuria, and in four cases, Nos. 1, 7 and 10 (*P. falciparum*) and 11 (*P. vivax*), trophozoites or schizonts were found during the fever which occurred a few days before the onset of blackwater fever. In one further case (No. 5) crescents were found two days before the attacks.

These facts illustrate the intimate association of blackwater fever with active malarial infection.

The type of malaria from which the 16 cases suffered was ascertained in 11 patients; in 5 patients no malarial parasites were found whilst they were under our observation, nor were past records of the parasites obtainable. Of the 11 which were diagnosed microscopically, in 9 *P. falciparum* was found, and in 2 *P. vivax*; for two of these diagnoses (one *P. falciparum* and one *P. vivax*) we are indebted to records forwarded from other hospitals nearer the Front.

Though no record of the finding of parasites was available in five cases, the clinical history clearly pointed to the occurrence of several attacks of malaria and in one of them pigmentation of the liver and spleen was found post-mortem.

Fever.

The temperature after rising to 102° to 105° F. at or soon after the onset of the attack usually remained high but irregular till the urine became of a normal colour, then fell rapidly and after two or three days remained normal. In a few cases a secondary or post-hæmoglobinuric fever occurred which was either associated with some complication, e.g., cystitis in Case 10, or was unaccompanied by any symptoms which suggested a superadded cause. In Case 2 a return of fever occurred two days after the first fall of temperature and lasted nine days, varying from 100° to 104° F. Both the primary and secondary fevers sometimes showed a tendency to tertian periodicity.

Anæmia.

There was usually extreme anæmia. The patient as a rule appeared blanched as after a severe hæmorrhage if the hæmoglobinuria lasted more than twenty-four hours, and the hæmoglobin in the blood fell to twenty-four per cent or even sixteen per cent. In a few cases in which the attack lasted less than twenty-four hours the percentage did not fall so low, e.g., sixty-two per cent and forty-two per cent in two such cases.

The anæmia appeared to be out of all proportion to the amount of blood lost in the urine.

Jaundice.

The jaundice observed was of very different degrees of intensity. In Case 15 the conjunctiva and skin became yellow on the day following the onset of blackwater fever, and the colour became progressively deeper till death; post mortem, all the tissues were deeply bile stained. In five other cases (Nos. 2, 3, 6, 10 and 14) the colour was like that seen in mild cases of catarrhal jaundice and distinctly exceeded that observed in Cases 1, 4, 5, 7, 8, 9, 11, 12 and 13, in which it resembled the icteric tinge of conjunctiva and skin not uncommonly seen in severe relapsing malaria. In Case 16 no trace of yellow colour was observable. The jaundice often increased during the attack and began to fade after two or three days to a week. Bile pigment was only found in the urine in one case, No. 15, but the presence of a large amount of hæmoglobin may have prevented the detection of a small amount of bile pigment by the ordinary tests (HNO_3 and iodine).

The blood serum gave a positive reaction for bile pigment during life in four cases, Nos. 7, 8, 10 and 15, out of seven examined.

Hæmoglobinuria.

The appearance of the urine was usually quite characteristic. The colour was deep brownish red or blackish brown like *café noir* or porter, and a paler deposit which sometimes occupied $\frac{1}{4}$ to $\frac{1}{6}$ of the vessel appeared after it had stood an hour or so. If the urine was alkaline the colour was a very deep brownish red or crimson and the deposit was less in amount. The urine was often so opaque that it required dilution before a spectroscope could be used. In other cases spectroscopic examination of the undiluted urine in a test-tube showed absorption of both ends of the spectrum, leaving only the red part in which the band of methæmoglobin or of acid hæmatin was seen. Determination of the kind of *pigment* present in the urine was complicated by the fact that there was usually a mixture of pigments. Methæmoglobin or acid hæmatin was in most cases present in addition to oxyhæmoglobin. The spectra of methæmoglobin and acid hæmatin are very much alike and unless these pigments are present in fair concentration the band in the red, which is the most characteristic part of these spectra, is not seen. The spectrum of acid hæmatin may for this reason be easily overlooked in a pale brown

urine. Oxyhæmoglobin is, in part at least, rapidly converted into hæmatin in acid urine. A method for estimating the degree of hæmoglobinuria is detailed at the end of this paper.

In two specimens of urine from Case 11 no spectra of hæmoglobin, methæmoglobin or acid hæmatin could be seen, although the urine was dark brown and contained much albumin. This was apparently in part due to the turbidity of the urine which had probably been in the bladder for twenty-four hours before it was drawn off by catheter. That the colour was due to altered blood pigment (probably chiefly acid hæmatin) was shown by the appearance of a reddish-purple colour due to the formation of hæmochromogen, after the addition of strong caustic soda solution. This reaction is a useful method of demonstrating the presence of altered blood pigment, for hæmochromogen not only gives a very characteristic spectrum, but the absorption bands are much darker than the bands given by the solution of hæmoglobin or hæmatin from which it is derived. Hæmochromogen was easily obtained in blackwater fever urine with caustic soda alone without the addition of any reducing substance though occasionally the purple colour did not appear till the solution had stood twenty-four hours. The hæmochromogen (reduced alkali hæmatin) is seen at the bottom of the test-tube and the pigment in the upper part is alkali hæmatin.

The *duration* of the hæmoglobinuria varied from twelve hours to five days (average 2·9 days). The urine after being dark rapidly became normal in colour in the course of twelve hours or less, and as a rule remained free from blood pigment. On the other hand, slight temporary variations in the colour occurred and a paler specimen was succeeded in a few hours by one of a very dark colour, or the hæmoglobin completely disappeared for a few hours or a whole day, and then a relapse followed. Complete intermissions of this kind occurred in two cases, Nos. 13 and 16. When the colour of the urine had recently become normal the brown centrifuged deposit, consisting of casts and cells full of yellow granules if treated with caustic soda, gave the colour and spectrum of hæmochromogen.

The *quantity* of urine passed in twenty-four hours was often increased to 60 or 80 ounces and sometimes to over 100 ounces during the hæmoglobinuria. This was no doubt in part due to the saline injections given by the rectum or intravenously. Some cases running a favourable course passed only 36 or 40 ounces. In the three fatal cases, and in these cases only, the amount of urine was much reduced; in two cases, Nos. 11 and 15, to 2 or 3 ounces in the twenty-four hours; in the third case, No. 12, the quantity was rather larger but could not be measured owing to incontinence during the last two or three days of life.

Albumin.—In the darker specimens of urine, the coagulable protein formed a very dense cloud on acidifying and boiling, which after standing twenty-four hours often occupied quarter to half of the test tube. After

the colour of the urine had returned to normal a thick cloud was generally obtained for two or three days and a trace sometimes persisted for a week or even a fortnight.

Deposit.—In the first specimens of urine passed during a blackwater attack the deposit consisted chiefly of small yellow granules; in some cases larger yellow granules or globules measuring 1 to 4 microns (0·001 to 0·004 millimetre) in diameter, which at first sight resembled red-blood corpuscles, were also present. About the second day renal cells and casts and cell-casts crowded with granules appeared. The casts and cells were in most cases very numerous and towards the end of the attack renal cells and casts packed with large yellow globules were often seen. Cells and granules were usually found in decreasing numbers for two or three days after the urine had resumed its normal colour. The scanty urine excreted when there was suppression of urine contained no renal cells or casts as a rule. A few red-blood corpuscles were found in one specimen of urine from Case 14 and in no other case. Barratt and Yorke [2] record the occurrence of a few red-blood corpuscles in the urine of a number of blackwater fever cases. It is important that the urinary deposit should be examined as soon as possible after the urine has been passed, since red-blood corpuscles are rapidly destroyed in acid urine.

Hæmoglobinæmia.

The blood serum was examined in ten cases and in four of these, Nos. 6, 9, 14 and 15, was sufficiently coloured with hæmoglobin to give a spectrum in a tube 0·3 to 0·4 cubic millimetre in diameter. Of the other six, in which blood pigment was not found in the serum, in three, Nos. 1, 7 and 10, the blood was taken only a few hours before the hæmoglobinuria ceased, in one, No. 16, during an intermission of hæmoglobinuria, and in a third, No. 4, after it had ceased; in the remaining case, No. 8, which was a mild attack lasting twenty-eight hours, the serum was examined within a few hours of the onset but hæmoglobin was not detected. Citrated plasma also was examined in two of the above cases, Nos. 14 and 15, and hæmoglobin was found in this as well as in the serum. Plasma was also examined in Case 16 during an intermission of hæmoglobinuria and no hæmoglobin was detected. In Case 15 both the serum and the plasma were examined on the first and second day of the attack and both were a deep brownish crimson on each occasion. The colour was due to methæmoglobin probably with some oxyhæmoglobin, and also in part to bile pigment. The evidence brought forward by Christophers and Bentley [1], and by Barratt and Yorke [2], indicates that the hæmoglobinuria in blackwater fever is the result of the presence of free hæmoglobin in the blood plasma (hæmoglobinæmia). Barratt and Yorke succeeded in producing hæmoglobinæmia and hæmoglobinuria in rabbits by injecting hæmolytic serum. It has been pointed out by Christophers and Bentley that the presence of hæmoglobin

in the serum is no proof of the existence of hæmoglobinæmia, since some lysis of the red corpuscles may occur during clotting.

The Treatment.—Every case received one or more doses of quinine daily during the hæmoglobinuria. This was given in the form of the bihydrochloride usually in doses of ten to fifteen grains, and, as a rule, intramuscularly, but when intravenous saline injections were given the dose was added to the saline in most cases. Some cases received fifteen grains daily for a week or longer, others were given doses of ten to fifteen grains at irregular intervals. When the tendency to vomiting had ceased, quinine hydrochlor. or quinine sulphate was given by the mouth. In two or three cases the temperature chart suggested that the quinine had some effect in reducing the fever. There was no evidence that the quinine increased or caused a relapse of the hæmoglobinuria. Saline injections were given regularly every four or six hours by the rectum in almost all cases. In the more severe cases, especially when the enemata were not retained, one or more intravenous saline injections of one to three pints was given with decided benefit. Other treatment consisted of a single dose of calomel (two grains) to several of the patients. Subcutaneous injections of digitalin, pituitrin, strychnine, and in Case 4 ten cubic centimetres of normal horse serum were given subcutaneously the day before the hæmoglobinuria ceased.

Post-mortem Examinations.—Post-mortem examinations of our three fatal cases all showed the presence of malarial pigment in the spleen and liver, and also dark blackish colouration of the apices of the pyramids of the kidneys. Microscopic sections showed blocking of the collecting tubules with hæmoglobin globules and renal cells full of large granules, and in addition dilatation of the convoluted tubules and capsules of Bowman. These changes were most marked in Cases 11 and 15, in which death was due to suppression of urine, and were present to a less degree in Case 12, in which the fatal issue appeared to be in part due to the extreme anæmia in addition to partial suppression of urine. The changes found in the kidneys agreed with those present in Barratt and Yorke's fatal cases.

The liver of Case 15, in which there was a high degree of jaundice affecting all the tissues, showed obstruction of the bile capillaries by inspissated bile.

In all three cases the contents of the gall-bladder presented a remarkable appearance. The gall-bladder was full of dark green, almost black bile of the consistency of very thick porridge. It was almost solid and after incision of the sac was turned out in a solid mass.

The Causation of Blackwater Fever.

Three chief hypotheses have been suggested to account for attacks of blackwater fever.

(1) That the attacks are due to a distinct specific infection which is acquired in malarial countries, probably because the infective agent is a protozoon inoculated into man by mosquitoes similar to those which intro-

duce the malarial parasites. There appears to be no direct evidence in favour of this suggestion. The hypothesis is rendered less probable by the occurrence of cases of blackwater fever in Great Britain and elsewhere, weeks or months after the subjects have left a malarial country, necessitating, according to this view, a long and variable incubation period. The fifteen cases of first attacks here recorded occurred one to five months after the patients had arrived in a non-malarial country.

(2) That quinine is the cause. Most advocates of this view postulate a previous malarial infection of considerable duration. The above cases do not throw much fresh light on this question. One patient, No. 15, stated that though he was supposed to have taken quinine regularly, he had "dodged it" and had taken no quinine for a week before the onset of blackwater fever. In most of the cases quinine had been taken for a long period before the attack, in some apparently with fair regularity. In others, an increase of the dose of quinine, or a renewal of its administration, had taken place one to seven days before the onset of hæmoglobinuria. In one case the patient took no quinine for seven days, and then took 30 grains, 60 grains, and 60 grains in three successive days; the attack of blackwater fever began on the evening of the second day on which sixty grains had been taken.

When the administration of quinine had been renewed or the dose increased shortly before the attack of blackwater fever this step was always taken as a result of a return of fever suggesting a relapse of malaria and, consequently, the two events have an equal claim to be regarded as the exciting cause of the attack.

Every case received at least ten grains of the bihydrochloride intramuscularly during the attack and most of them had several such injections of ten to twenty grains. In four cases, Nos. 3, 11, 12 and 15, intravenous doses of the bihydrochloride of quinine were given with one or more pints of saline solution. These intramuscular and intravenous injections did not appear to increase the hæmoglobinuria or do harm. It so happened that two of the three cases which died, Nos. 11 and 15, received most quinine intravenously, but these doses were given after the onset of suppression of urine, and with the saline solution which was being injected on account of the anuria. Case 3 received two doses intravenously; the hæmoglobinuria ceased on the same day that the second dose was given, the first dose having been given the day before. Other cases which ran a short and comparatively mild course received fifteen grains intramuscularly daily for as long as seven to ten days.

These facts relating to quinine administration, though not conclusive nor different in kind from previously recorded evidence on the subject, do not lend much support to the view that quinine evokes attacks of blackwater fever.

(3) That blackwater fever is due to repeated attacks of malaria.

In considering the association of malaria and blackwater fever there are three striking points which come into prominence:—

(i) The patient has suffered from attacks of malaria on and off for months or years before the onset of blackwater fever.

(ii) Recent attacks of malaria have usually occurred and the blackwater fever is often immediately preceded by a malarial attack, e.g., Case 10 (see Table I), during which parasites may be found in the blood. Moreover, the symptoms immediately ushering in the blackwater fever are, as a rule, indistinguishable from a malarial attack. The evidence does not, however, point to blackwater fever being one of the forms of "pernicious malaria," such as cerebral malaria, pernicious hepatic attacks with severe jaundice, or pernicious renal attacks with hæmaturia. In these latter cases parasites are usually very numerous in the peripheral blood. It seems rather that repeated attacks of malaria produce a condition in the body which predisposes to the lysis of the red corpuscles and resulting hæmoglobinuria as suggested by Christophers and Bentley (see also Stephens and Christophers) [5].

(iii) The parasites are absent or rapidly disappear from the peripheral blood during an attack of blackwater fever.

Our cases agreed with the previous accounts quoted above in these three points, but the absence of malarial parasites or their disappearance during the attack of blackwater fever in our cases was not remarkable since quinine was given in every case, often in large and repeated doses.

The close association of malaria with the blackwater fever attack in some of our cases is described above and all our cases had had frequent relapses of malaria.

Method of Estimating the Degree of Hæmoglobinuria.

Direct estimation of the amount of blood pigment in the urine by comparison with a colour standard is very unsatisfactory because the kind of pigment is not always the same and there is often a mixture of pigments. Moreover, some of the blood pigment is not in solution, but is found in the deposit. A modification of Sahl's method in which the hæmoglobin is first converted into acid hæmatin appeared to be a solution of the difficulty.

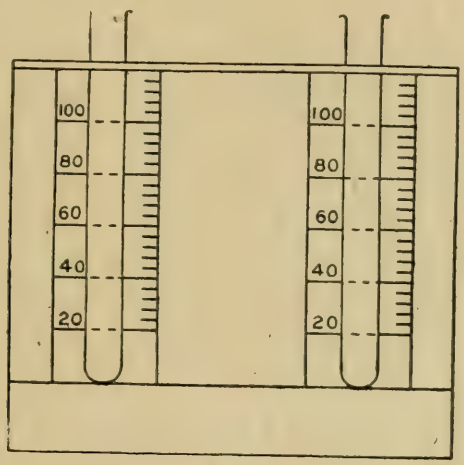
Method for Urine.—Since blackwater fever urine probably never contains more than twenty-five per cent of the amount of the hæmoglobin in normal blood (the highest figure which we obtained was 12·5 per cent) tubes about 1·5 cubic millimetres in diameter, i.e., twice that of ordinary hæmoglobinometer tubes, were used, and a standard solution of acid hæmatin was made with 0·5 per cent instead of one per cent of normal blood.

Several tubes of equal diameter were selected and calibrated with mercury at 1, 2, 5 and 10 cubic centimetres. The colour standard was prepared by taking 0·05 cubic centimetre of normal blood and making it up to 10 cubic centimetres with $\frac{N}{10}$ HCl saturated with chloroform as a preservative.

A wooden stand carrying a graduated scale as shown in the diagram was made and the scale so arranged that the 100 mark corresponded to the

10 cubic centimetre line on the tube, the 10 mark with the 1 cubic centimetre line, etc.

To make an estimation, 0·5 cubic centimetre of urine was placed in one of the tubes and 0·2 cubic centimetre of $\frac{N}{1}$ HCl added. The contents were well mixed and allowed to stand for a minute in order that the solution might become clear. Dilution was then carried out with water till the colour matched the standard. To obtain the percentage of hæmoglobin in terms of blood the number read off the scale must be divided by ten, since the amount of urine used is ten times that of the blood used in making the standard. Thus a reading of fifty means that the urine contains blood pigment equal to that in a five per cent solution of blood. (This we have called five per cent hæmoglobin.) If the percentage of hæmoglobin is small, less than two per cent, 1 cubic centimetre of urine should be taken for the test instead of 0·5 cubic centimetre and the reading divided by twenty.



That the whole of the hæmoglobin and altered blood pigment in the urine is really converted into acid hæmatin and correctly estimated by the above method was shown by the following experiments:—

(1) A solution of defibrinated rabbit's blood in water was taken and five cubic centimetres placed in two tubes A and B; to A was added 0·2 c.c. of water and to B 0·2 c.c. of one per cent solution of sodium nitrite. In tube B, methæmoglobin was found giving characteristic absorption bands.

The amount of blood pigment was then estimated in each by the method given above.

A. Exp. (1) 0·5 of A	+	0·5 c.c. $\frac{N}{10}$ HCl (mixed)	+	H_2O as diluent.	Estimated Hb	50 to 54 %
Exp. (2)	,,	+	,,	,,	+	,,	,,	,,	,,	48 to 52 ,,
B. Exp. (1) 0·5 of B	+	,,	,,	+	,,	,,	,,	,,	48 to 52 ,,
Exp. (2)	,,	+	,,	,,	+	,,	,,	,,	,,	48 to 52 ,,

The estimations before and after the formation of methæmoglobin were practically identical.

(2) The method was also tested by adding blood to acid and alkaline urines and estimating the hæmoglobin both before and after (1) placing the mixtures in the incubator at 37° C. for the night and (2) leaving it at the temperature of the laboratory (15° to 20° C.) for a fortnight; a few drops of chloroform were added to prevent the growth of bacteria. The estimated percentage in the different samples of urine did not alter during these experiments. These tests were necessary because when blood is mixed with urine and allowed to stand such changes take place in the colour and appearance of the urine that estimation of the hæmoglobin content by direct comparison with a colour standard is rendered impracticable, and it seemed possible that part of the hæmoglobin would have passed beyond the stage at which it could be estimated as acid hæmatin. Cf. observations by Barratt and Yorke [2] on changes in blood when mixed with urine.

This method of measuring the blood pigment in the urine was not adopted till most of the cases in the present series had recovered, but the results obtained in Cases 14, 15 and 16 are shown below. As a further illustration of the uses of the method the percentages found in a case of acute nephritis with deep red urine due to hæmaturia are also given. Case 14 (blackwater fever) after admission to hospital passed at least 1,640 cubic centimetres of dark porter-coloured urine between 3 p.m. April 4, and 6 a.m., April 6. The different specimens passed gave the following percentages of hæmoglobin (all the urine was not collected):—

April 4	3 p.m.	..	3·9 %	April 5	11.45 a.m.	..	3·9 %
	6.15 ,,	..	3·8 ,,	,, 6	1 ,,	..	2·7 ,,
	8.45 ,,	..	4·3 ,,		6 ,,	..	2·2 ,,

Case 15 suffered from almost complete suppression of urine; the estimated hæmoglobin in the few ounces excreted on April 5 and 6 respectively was 12·5 per cent and 5·6 per cent. These estimations may be rather excessive owing to the presence of bile.

On the other hand, Case 16, a very mild case of blackwater fever, excreted urine containing only 1·7 per cent and 0·7 per cent when the hæmoglobinuria was at its height. It must be remembered that a large part of the hæmoglobin excreted is found in the deposit, which must be well mixed with the urine before a sample is taken for the estimation.

Taking Case 14 as an example and assuming that as much as fifty ounces of urine (48 to 52 oz. measured) were passed daily during the five and a half days that the attack lasted and that the content throughout was 3·9 per cent of hæmoglobin, then the daily loss of blood by the kidneys would be 1·95 ounce or 11 ounces during the whole attack if the hæmoglobin of the blood were normal. The hæmoglobin in the blood during the last two days fell from fifty-four per cent on April 4 to twenty-four per cent on April 6, with a red-corpuscle count on the last day of 1,376,000.

A loss of this order does not seem nearly enough to account for the

extreme anæmia produced during blackwater fever attacks. It must be remembered, moreover, that in Case 14 the attack lasted an unusually long time.

Errors Due to Associated Abnormal Pigments.—A slight degree of error in the estimation may arise if the urine contains much additional abnormal pigment.

(1) Urobilin is frequently present in large amount in the urine of blackwater fever patients but not as a rule till after the hæmoglobinuria has ceased. In order to see whether a large error would arise from this cause a solution of hæmoglobin (blood diluted with water) was added to a very highly coloured urine containing much urobilin. It was found that the estimation was not appreciably affected if the hæmoglobin content was at least two per cent, since in this case the urine was diluted not less than four times during the estimation.

(2) Urochrome may in the same way cause rather too high a reading, but in the case of a dark yellow urine which was tested, it did not alter the estimate if at least two per cent hæmoglobin was present.

(3) Bile pigment if present in large amount may affect the estimation. If the amount of bile pigment is very large, especially if the hæmoglobin content is low, the method is inapplicable. If a large amount of bile-pigment is present and the percentage of hæmoglobin is two per cent or more, the difficulty may be obviated by taking 0·25 cubic centimetre of urine instead of 0·5 cubic centimetre. We have, however, only once been able to detect bile in the urine of blackwater fever, and apparently it has only rarely been found judging from the records to which we have access.

Our observations have led us to certain definite conclusions regarding the causation, pathology, and treatment of blackwater fever. We feel some diffidence in expressing our views, because our experience has been restricted to one set of conditions, and we have had only limited access to the literature of the subject. Our observations in the main support the views of Stephens, Christophers and Bentley, Barratt and Yorke, and others.

Conclusions.

(1) Blackwater fever is due to malaria.

(2) It is predisposed to by a long standing malarial infection with repeated relapses.

(3) An attack of blackwater fever is precipitated by a relapse or recurrence of malaria.

(4) The ascertained *maximum* and *minimum* intervals in different cases in our series between the arrival in a malarial country and the first attack of blackwater fever were *maximum* ten years, *minimum* seven months; between the first recognized attack of malaria and the first attack of blackwater fever were *maximum* ten years, *minimum* fifty days; between the arrival in a country which was non-malarial and free from *anopheles* and

the first attack of blackwater fever were *maximum* five months, *minimum* one month.

(5) Quinine in the class of cases with which we have met has no share in producing blackwater fever, nor has quinine treatment during or after the attack any effect in prolonging or reproducing hæmoglobinuria.

(6) The jaundice of blackwater fever is certainly in some cases due to bile-pigment in the circulation.

(7) It is possible to estimate the total amount of blood-pigment in the urine, whether in solution or in the deposit, after converting it into acid hæmatin (modified Sahli's method). The amount of hæmoglobin lost by the kidneys is much greater than would be ascertained by an attempt at direct hæmoglobin estimation of the urine. We are convinced, however, that the kidneys excrete only part, possibly a small part, of the hæmoglobin which is lost in an attack of blackwater fever.

(8) The treatment which appeared to be of most value was intravenous or rectal administration of physiological salt solution (NaCl 0·9 per cent). Whether quinine is of value or not was difficult to decide, since all our cases had some quinine and the intensity of the attack was no doubt different in each case.

Our best thanks are due to the medical officers of St. Andrew's and St. David's Hospitals, who were in charge of the cases of blackwater fever, for permission to publish their clinical notes, and for their courtesy and constant assistance. Especial thanks are due to Major Campbell, R.A.M.C., Captain Fannin, R.A.M.C., and Captain Allen, R.A.M.C., and Dr. Bell, Dr. Gilchrist, Dr. Gorrie, and Dr. Rougvie, medical officers attached Royal Army Medical Corps, of St. Andrew's Hospital, and to Lieutenant Barrett, R.A.M.C., and Dr. Hollway, medical officer attached Royal Army Medical Corps, of St. David's Hospital.

Dr. Hollway not only supplied careful clinical notes of six cases, but by examining many blood films was able to establish a diagnosis of the species of malarial parasite in all her cases.

We were very fortunate in having the advice of Colonel A. E. Garrod, A.M.S., in connexion with the spectroscopic work and the identification of urinary pigments.

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SOME MUSINGS OF AN IDLE MAN.

By Colonel R. H. FIRTH.

I.

I picked up the daily paper, a few days ago, and saw the death announced of a man who had been a fellow-student with me and an intimate friend of early days. How many years ago, I was reluctant to estimate. His path had diverged widely from my own and we met but rarely, still the notice of his death roused many memories of happy days, of occasional riotous living, and of consistent rivalry in the schools. He and I had competed for many prizes and it was satisfactory to recall that I had more firsts than he had. He was a dear good fellow, as generous and sporting as he was industrious and clever. He was what they call a brilliant young man, and it was around that brilliancy that my thoughts wandered. It comes quite naturally to call him a brilliant young man, but how difficult to refer to him as a brilliant middle-aged man. It seems as if there is a time of life at which most of the brilliant cease to be brilliant, and that time appears to be the moment at which men engage in the serious business of life. I believe that I myself was occasionally referred to as being a brilliant young man, but what little brilliancy I may have had soon got rubbed off and I found that it is easy to be brilliant only when you are doing nothing in particular and have no responsibilities or, at any rate, doing nothing for which you are paid. The moment you begin to earn money or try to earn it, the difficulty of being brilliant increases many times. Possibly, therein lies the reason why middle-aged men are so dull; for one thing, it is difficult to be brilliant over a task imposed by necessity and, for another, the world, most certainly the official or service world, does not want or encourage you to be brilliant. Those who applauded your brilliance before, now become impatient of it, and the safe course is outlined by the old tag, "medio tutissimus ibis." Emerson has put it well: "The moment a youth sets to work to earn his living he is intellectually married and must settle down to a different state of existence without attempting to prolong the airs and graces of youth."

Of course, there are men who will not consent to this change, for they persist in their brilliance much as an elderly coquette persists in the exercise of her charms. These, however, are the people who are more impatient than youth itself at the dullness of successful middle age; but, for all that, their brilliance is forced, because youth loses its charm when it is no longer young. There is no getting away from the fact that there is a season for everything, and the season for brilliancy is over for the man who is past 25. The thought comes—if only brilliant youth knew how many of the dull were brilliant once it would be less confident in its own

brilliance. But youth sees no likeness between middle age and itself; it thinks ever that the last generation must be the dullest ever born because it is just that generation which it sees at work. I believe Titian was a brilliant painter until well over ninety years of age, but Wordsworth had lost all his brilliancy as a poet by the time he was forty. Much as we may lament our loss of brilliancy, yet it is remarkable how cheerfully we face that loss. We realize that our business in life is to do rather than to be. By doing our best at what we are doing, we forget how brilliant we once were when doing nothing particular; or, we remember it only when we see the brilliance of the next generation with pleasure and a little sadness. Young men may wonder why and how we older ones can be so dull, but they will learn the secret only too soon, and meanwhile it behoves them to be kind to us. We were sparkling fellows once, but we have ceased to sparkle so that we may live. Therefore, let brilliant youth be not too contemptuous of middle-age dullness; it has not faced the ordeal that all brilliance must submit to. If the brilliant youths of this day can keep their brilliancy through all the dust of sweeping offices or whatever other task is set them in the struggle for existence, then they will have the right to laugh at our dullness; but, only then, and that then is as far off as the Greek Kalends.

II.

We constantly see references to what is called the *moral* of troops. It is a word we have taken from the French and very frequently spell wrongly by adding an "e," which then makes it mean fair-dealing or honesty. By *moral*, one means that something the need of which by the soldier was never greater than now. Formerly the acquirement of that degree of discipline, confidence and spirit, which the French call *moral*, was a question for the professional soldier only, but, in these days, it affects the whole manhood of our race. Fortunately, a general high standard of intelligence makes the acquirement of the asset relatively easy. If we analyse the quality, we find there is a *moral* of the officer and a *moral* of the other ranks. The latter is largely a matter of environment and food supplemented by good leadership. It is something automatic in nature and manifested by good spirits, cheeriness and confidence. The *moral* of the officer is a more delicate thing to acquire and perhaps cannot be taught, for it embraces the whole art of leadership, which itself is the womb of *moral*, and many men are incapable of leading their fellows. In plain language, it is not every worthy man whose *métier* it is to be an officer and, unless it be his *métier*, that man should not be placed in the position. We all remember the centurion of the Scriptures, and, just as the officer of to-day is tested by the way in which he says "Go" and "Come," so the man is tested by the way in which he "goeth" and "cometh." Whether the men respond by going and coming with hesitation and misgiving or with speed and confidence depends on how much they mistrust or believe

in the officer. It is a great gift to have the knack of managing men, some men being born with it, but not all men can be taught it.

There are some who think that a good officer is born not made. Personally I doubt the truth of that, for the fairest field will grow weeds instead of corn if not cultivated, and a barren field will grow corn if it is tilled. Probably, the greatest influence of *moral* is in respect of its control over fear. Every man is susceptible to fear, and because it is the skeleton in every soldier's knapsack it is the one moral factor more potent for evil than any other. There are a few men of whom it can be said that they are so little shaken by fear that it is no burden on them : the greater number of men are susceptible to fear, but their self-respect is proof against any possibility of their being betrayed by it. These are the people who do not want to die, but would much rather die than be seen to flinch. Then at the bottom of the scale are a few miserables whose moral strength is incapable of overcoming fear ; they are the men who would sustain any disgrace rather than submit themselves to great bodily danger. For all these types the development of *moral* is a great help, and when the officer can show to his men that he is as superior to them in all moral qualities as he is in rank, he has gone far towards developing his own *moral* and theirs too. It is the curious combination of tact, efficiency and sympathy in the officer which engenders that still more extraordinary spirit of cheerfulness, even under acutely depressing conditions, that establishes the *moral* of an aggregation of men. Emulation and *esprit de corps* are valuable factors, but they must not be confused with those vulgar vices jealousy and cheap swagger ; these latter are destructive of respect, confidence, contentment and comradeship. Respect is a valuable moral factor, but it must begin at home. If a man does not respect himself, he must not expect others to respect him.

The whole question of *moral* is one of the most interesting of psychological studies, and nowhere does one find a greater field for observation on these points than in the new armies. Napoleon is said to have remarked that he would rather have an army of stags led by a lion than an army of lions led by a stag. It is epigrammatic but true and, in quality of leadership, expresses the whole truth. We need to remember that men can so saturate themselves with the will to conquer that, even if they fail of conquest, they can at least render themselves invincible in a real sense. This is true of both officers and men, and the latter can best catch the infection of *moral* from the former.

III.

The appearance of a certain Gazette gave rise to some caustic remarks in a mess in which I live. As one listened to the comments regarding certain people being members of a mutual admiration society, one was reminded of Æsop and his fables. Admitting that there may have been some taste of sour grapes in the mouths of the more talkative of our

number, still, one found it difficult to avoid reflection on the general question. Of course, for men outside the pale there is something very irritating about a coterie whose chief characteristic is admiration of each other, much as there is often something irritating in the infatuation of lovers. With these latter, however, we can be lenient, as we all have been or may be in love. In both cases illusion plays a big part. However true this may be, it is difficult to deny that there is something derogatory in our irritation at what are called mutual admiration societies. That irritation is but another word for envy of a little world within a world, and whose inhabitants seem to have some secret of power denied to ourselves.

In my younger days I moved in certain artistic circles, and was brought much in contact with a set of men and women who had been and were much under the influence of Rossetti, and who all admired each other and all their work. To me, as a Philistine, they were amusing people for whom I had an active scorn, but maturer years have convinced me that had it not been for their association with the master and with each other, few of them would have attained the eminence they did reach and so much above their natural powers. To them, geese of the right kind were always swans, and many geese became swans by mere contact with and suggestion of the others. I have no desire to be cynical, but undoubtedly the most mediocre of them were redeemed from mediocrity by the fact that they could recognize a teacher in their master and in each other. It was this fact which distinguished them from all outside, and which was the basis of their mutual admiration. In official circles, the same is operative; accident often brings a set of men together, but common tastes and a common aim are a bond of which mutual admiration is the natural result. Their idealization of each other may find expression in Gazettes, but the ideal is based upon realities and a freedom from all delusions about human nature. Their guiding philosophy is that it is a greater error to mistake swans for geese than to mistake geese for swans; the latter may be a matter of nomenclature but the former never so.

IV.

The juxtaposition on the same page of a daily paper of a summary of our losses in this War and the latest returns of the birth, marriage and death rates of the home population gives food for thought. It is an old question, but one about which we cannot think too much. Last year[1] we lost in round numbers 100,000 men killed, or about half as many again as the deaths from tuberculosis, which is our most deadly disease; but tuberculosis does not take our best men. Meanwhile, what was happening in compensation? The only true compensation for deaths is births, and yet the birth-rate for 1915 is the lowest on record, or 21·9 as compared with

[1] This was written in February, 1916.

the previous lowest of 23·6 in the preceding year. To make matters worse, the civil death-rate rose much above the average of the last ten years. One is not much surprised at this latter fact as the death-rate must rise the more we become a nation of elderly people. Before the commencement of this century, the rate of increase of the age-group (15-20) was at least four times that of the age-group (65-70). Between 1901 and 1911, however, the actual growth of the younger population was some 86,000, while the growth of the older group was 156,000. Further, these disquieting facts are not softened by the circumstance that the present infantile mortality rate of 110 is the highest since the hot and unhealthy summer of 1911.

No matter how we look at the question, we have to admit that 1915 was a bad year, and the irony of the position is emphasized when we realize that the same period saw our Imperial possessions increased by many hundreds of thousands of square miles. Thus, our Imperial responsibilities have been and are increased while the white man, whose burden they are and will be, is failing in the task of maintaining the living foundations of empire. So much for the question of numbers. As regards quality, the racial prospect is almost as serious. The dysgenic influence of the war touches only one sex, but maternal alcoholism, distinction between social classes and the disinclination of our best women to marry under present conditions involves the other sex and next generation, besides aggravating the whole case. Disturbing as the facts and the thoughts which they raise undoubtedly are, still there is nothing inevitable in the Imperial fate towards which we seem to be drifting. The range of remedial action is immense and its possibilities adequate if the need be realized. The lines of action are clearly defined and point to concerted and national endeavours to secure and safeguard ante-natal, natal and early infantile stages of nurture. Further, on the Imperial plane, we need to remedy that great factor of our low birth-rate at home and in the Colonies which depends upon the excess of women at home and the defect of them overseas. If returned soldiers are to emigrate and populate our new and old territories, we must see that those who go take wives with them. The writing on the wall is plain, and we need to rescue eugenics from being a cover for opposition to certain social reforms. The goal for which all should strive is the preservation and increase of the race. In so striving, there must be no hiding of the truth, but the dissemination of knowledge of facts and needs; the needs are a recognition and fulfilment by women that Nature intended them to be the mothers of children with, once the children are born, individual and corporate effort to secure their survival. Our profession has done much for individual hygiene, surely it is time that it worked explicitly for racial hygiene? Let us not forget that each one of us is or ought to be a teacher, and our duty to ourselves and our race is to make the heads of our fellow compatriots not graves but mines of knowledge concerning the facts of this national question. It is for us

all, be we in civil or military life, to educate the laity, making facts plain and not mincing words as to the remedy. Only if we be wise in such ways can the innumerable unborn of our race inherit from us the vital means wherewith to discharge their task, as the trustees of the greatest empire and of the highest ideals which the world has known.

V.

I have just come back from a conference at Army headquarters. There, a man had explained that his corps was wonderfully free from a certain disability and, suddenly, interrupted his remarks by saying, "I touch wood," and grasped the back of a chair. As I rode back in the car to my own headquarters, I got thinking over the whole incident and am tempted to jot down one's thoughts. Now, it is evident that we have in this incident the survival of a curious custom which helps to make us understand what superstitions were to people who really believed in them. The man who was the cause of these notes is, I happen to know, one who would be much hurt if anyone said he was superstitious. Yet, unconsciously, he betrayed a fear of a Nemesis provoked by boasting so much that by a habit he checked the confession of a pleasure or happiness. I own that I have been guilty of the same act myself, and admit that it is an expression of half unconscious misgiving which overcomes me now and then, indicative of a fear to believe that I have weathered certain troubles and still more afraid to say so. At such times, superstition is no mere romantic diversion but a relic of the real intimidating demon of the past.

I have a sister-in-law who is a veritable high-priestess of small observances of this kind, and she is a fruitful source of amusement to me. Often, as I have noted her quaint remarks or acts, has the thought come that superstitions of the kind are but survivals of a more primitive state of society. There was a time when superstition was a real and overshadowing fear to everyone, and, as people had a complete belief in their superstitions any rites which they imposed were regarded as disagreeable necessities. With us, under a looser dispensation, such superstitions as we retain have become romantic curiosities to frivolous minds. The killing of wild animals is no longer necessary as a means of getting food, but it delights people from its spice of danger and its chances of failure or success; in the same way, superstition being no longer seriously believed presents an element of fear which appeals to certain minds. Their real fears are elsewhere, and these sham fears cause enjoyment simply because they are incongruous with our conception of the universe, and do not entail the constant and cumulative anxiety caused by real fear.

Another factor which tends to encourage the observance of such acts as taking one's hat off to the new moon, or turning one's money at the sight of her, and the reluctance to sit down thirteen at table is the circumstance that many of us are a trifle bored by our sense of the relation between cause and effect, and we strive to explain or imagine escape from it. Our

friends who do these things know perfectly well that the course of events will not be affected really by helping some one else to salt or walking under a ladder, but it is pleasant to them to believe in a surviving arbitrary streak in the constitution of the universe and we, of less sensitive minds, find the dullness of the day relieved by a streak of unreason betrayed suddenly in rational people. The reader must not think that these thoughts are expressive of any personal sense of superiority; far from it, they are but an attempt to argue out why and wherefore certain lapses to a primitive mode of thought occur. They come down to us from a time when there was no sense of the relation between cause and effect, and when everything out of the common was regarded as the interposition of some unknown power. None will admit a wish to return to this conception of things, but few of us are free from a pleasure in primitive thrills of the kind, for they enliven the dullness of civilized life, very much as some ancient curio contrasts with and relieves the dullness of photographs and other timid ornaments of a modern drawing-room. In thus thinking of the ritual of the superstitious, we obtain a warning that our modern security is not secure and our modern reason not yet wholly rational. We find that we are less civilized than we thought, and that we must not play tricks with our minds out of mere lightheartedness. How much each one of us needs the lesson can only be answered by ourselves.

VI.

The present time of worry and anxiety is a fruitful source of growls and grumbling. At lunch the other day, a man came in and exclaimed, "Oh that I had wings like a dove, for then would I fly away and be at rest." He belonged to our "Q" branch and evidently had been having a bad time of it in the office. Strictly speaking, rest is not immediately to do or be, but to cease from doing and being. It is difficult to associate rest with a bird, because it is among the most restless of creatures; that is, it is either all movement or all repose. Yet, to many people in our modern life, the idea of rest is inseparable from that of movement. When we are weary or bored, most of us feel sure that if we could be somewhere else we should find refreshment in the change and, in our modern version of the Psalmist's aspiration, we should substitute the words "motor-car," "yacht" or "wagon-lit" for "dove." The funny part about it is that, when we have thus gone in search of rest we rarely find it, but stumble merely on to a different kind of weariness. The truth is, rest like happiness is one of the many things which are not to be found by pursuing them. Rest must be a visitor and not a captive; moreover, rest is a shy visitor for whom preparation must be made and then perhaps if we keep still it will come.

All who have been in the East are familiar with the degree of cultivation of the art of repose manifested by Orientals. Their idea of rest is repose in its simpler forms and in marked contrast to the Western

gospel of being strenuous for its own sake, and as the only way in which life could be made worth living. To many, what we call strenuousness is but another name for restlessness and inability to keep still. There is no merit in activity for its own sake or irrespective of the ends to which it is directed. Unless watched, such strenuous activity becomes a disease whose symptoms are only to be allayed by a constant indulgence in the irritant which causes them. Examples of this misdirected or pathogenic activity are familiar to us in the women who can never be still, who hate to be alone, and who must be ever rushing here or there. True, this time of war has pulled up many of these women as with a bit, and not a few are working efficiently and well, and also glad at the end of the day to sit alone and enjoy repose. This is one of the few good things we have obtained by serious war, and it is the discovery of work that has brought to many restless women the discovery of real rest also. For the one is the complement of the other, so much so that it is nearly as important to know how to rest as it is to know how to work. These and others, but a few degrees different, are the people who have discovered their own homes and their own resources for the first time. And although over almost every home there is a shadow, since that home must be the centre of real things, so people, instead of running away from their sorrows, are able to remain and face them, and perhaps to find that such sorrows are not all bitterness.

It may be paradoxical, but war with all its horrors has given to many as well as taken away. It seems a terrible cure, and one prefers to think that the benefit comes less from the cruel realities of war than from causes which are incidental and truly good in themselves. One may be an optimist, but the signs of the day suggest that organized idleness has disappeared, and that both men and women find real work to do instead of what was only make-believe. From this real work comes weariness, and from that weariness comes rest. So, in this manner, a benefit from the war lies in the circumstance that many people have learnt to rest in a new way, namely, by being still. The particular kind of fidgety restlessness that was afflicting the modern world, and of which perhaps this war was the culmination, has been soothed, and so for some, at least, the present great upheaval is by no means all on the wrong side of the account.

VII.

Going home on leave, lately, one of the first things to arrest my attention, on a hoarding as the train ran slowly through Folkestone, was a placard on which the words "Bad Form" stood out prominently. Subsequently, I found out that the placard was an appeal to women to refrain from extravagant dressing. During the journey to town, I got thinking over the phrase "bad form," and to analyse the question as to whether there is any criterion of right and wrong in matters of "form" or taste. Good or bad "form" is nothing but a colloquial variation on

having or not having good or bad "taste." This is an instance of how thought is curiously at the mercy of words and often confused by the use of words in different senses. Now, one man may like red hair on a woman and another dislike it, also one man may prefer spending his holiday in the Alps and another at Swanage or St. Andrews. We may regard each of these likes and dislikes as a matter of taste, but we may not label them as being either good or bad taste. If we speak of good or bad taste and form, we refer clearly to those likes and dislikes into which the will and mind enter and which can and ought to be affected by judgment, the outcome of training or experience.

There was a time when people thought of taste as something arbitrary and unconnected with intellect. We think differently now, since we speak of good or bad form and taste in matters of conduct. It is an interesting development as it indicates that we are aware of a connexion between beauty and goodness, and judge of the motives of an action by the manner in which it is performed. This appreciation of manner of doing a thing is further an artistic standard, for a work of art is judged by the manner in which it is executed rather than by the motives of the artist. In matters of conduct, bad form or bad taste is only brought home to us when it makes some appeal to the emotions and makes it badly. A man may be brutal, selfish and ruthless, but so long as he does those acts of conduct without any attempt to conceal their character by incongruous excuses, we do not label his actions as being bad form or in bad taste. In many of our daily actions we display no kind of taste or good and bad form, because we make no kind of emotional appeal in our performance of them. So long as we perform our actions simply and without trying to produce effects not proper to them, we can escape the imputation of bad form. Our dislike to bad form in matters of conduct would seem therefore to be dependent on the recognition of some kind of insincerity that disgusts us. Many acts may be in bad form though not wrong in themselves; but bad form is the product of a man's whole nature because if he could see that it was bad he would not be guilty of it. His acts are such as would move him if some one else did them, and any appeal made to us in what we deem is bad taste involves the assumption by the appealer that our own taste is the same as his own, and then follows our resentment and desire to prove that it is not so. It is always more difficult to protest against bad form than against actual wrongdoing; for how is one to prove that it is bad form?

This brings us back to our original thought; is there any criterion of right and wrong in matters of taste or form? A tempting answer is "no," or to say *chacun à son goût*. A moment's reflection, however, suggests that in all questions of form or taste there is as much right or wrong as there is in morals. We all admit that, in matters of conduct, there is a definite standard of right and wrong. In such cases, the only criterion is the judgment of the right-thinking man, or of the man whose habitual

right conduct has endowed with a right judgment. Similarly, in matters of form, the man of good taste is also best fitted to decide. The critic may here say, "I recognize the need of some standard of conduct if I am to live at peace with my neighbours and myself, but whether I have a sound standard of taste is a question which concerns mainly myself." True, but good taste and its brother good form is indissolubly associated with good conduct, as judged by the standard of the period; further, good taste is partly an inborn gift and partly one cultivated by practice and study. Just as there are men born with an inherent bias towards virtue, so there are men born with an inherent gift of good taste. In each case, the study of great examples is needed to refine and perfect the native gift. The human mind has a certain timidity which dislikes what is precise and original, hence imitations, vague and sentimental things have their short day. It is the mark of bad form to be taken in by these, to prefer the imitation to the original, hence bad taste is usually deceived only by the frauds of its own time; and the man who has good form is he who conforms most closely to the best ideals of the age in which he lives. Tastes vary from age to age, but certain things delight all generations and these are the materials on which all good taste must be based, and the man who bases his conduct on those things is he who has good form. It is only by the study of the high thoughts of men and the contemplation of noble deeds that an unimpeachable good taste can be acquired. The judgment of the world refined and rectified from generation to generation is final and brooks no appeal, and St. Augustine's dictum *securus judicat orbis terrarum* comes back to us as meaning more than we used to think it meant. Few of us who wrote that line in our copy-books as boys realized that a day would come when the principle which it inculcated would need to be placarded all over the country to prevent people flaunting about in fine clothes, cheap furs and shoddy jewellery, pretending to be better than they are. In other words, we are asked to show good form and to judge conduct as the old Greeks judged it by regarding the æsthetic and moral standard as the same. Unfortunately, for the greater number, the words and confession which Ovid put into the mouth of Medea in her famous soliloquy are only too true, and most of us have to say, in respect of this matter, *video meliora proboque, deteriora sequor.*

VIII.

Circumstances have placed the Corps Headquarters to which I belong in a true piece of rural France and one's surroundings in the balmy days of early April make one realize that the biology of spring is a book of many pages. Our spring does not come in one triumphant rush; it promises and disappoints, it advances and retreats, but still we feel the difference between its earliest signs and the last belated day of autumn. Even the birds feel the difference, and seem warned by the change in the sunlight and the stir of the wind that their time of work and happiness is coming.

One looks for early migrants and wonders how they, in their southern winter quarters, begin to grow restless and remember the pleasant woods of northern Europe. For those wanderers there can be no news except by change in Nature, and they do not know the extent of man's folly and ambition as imprinted on the corn and beet fields of France. For them, the world is but the earth with its natural changes and future; and though they have to wage the struggle for life they have made no cult of it. Death comes to them, but it is not foreseen, glorified or prepared for. Possibly they have no souls, but having none they do not misuse them, and we can understand why the Teacher spoke of them and the lilies of the fields to men for whom the soul had become a trouble to itself.

I look about me and all around is the message that this is the time of year associated with that capacity of becoming young again which so many living creatures, including man, have lost in greater part. Each walk I take shows me signs of rejuvenescence in Nature, but in the world for which man is primarily responsible it is all too easy to find examples of senility. Such senility, marked by degeneration or inhibition, liability to disease, and an ungearing of important parts of the organism is more or less unknown in wild Nature, or that which has not suffered from man's interference. One asks the question, Why? The answer seems to be that the conditions of the struggle for existence in Nature are such that senility is not tolerated, and that the average duration of life is punctuated in reference to the welfare of the species. Plants and creatures come to a natural end when their processes of rejuvenescence fail to keep pace with their processes of senescence.

As distinguished from senility, senescence is an all but universal retardation of vigour or resisting power, and itself the consequence of changes in the colloid substratum which forms the chemico-physical basis of life. In plants and some creatures, such as the protozoa, the recuperative processes are so perfect that natural death need never occur, or at least be long delayed. In them the colloidal and protoplasmic substratum can be restored piecemeal, and the creature never grow old. But as life becomes more complex and the organism more of an agent, it becomes more difficult for the processes of rejuvenescence to keep pace with those of senescence. As one looks at the bursting buds the thought comes, Has not this led to special periods of rejuvenescence in plants, or to those remarkable phenomena of a return to almost embryonic life familiar to us in the pupa stage of flies and insects? In man, the physiological stability of his protoplasmic substratum and its associated increase of individuality would seem to limit the capacity for rejuvenescence. The penalty is individual death, for the very processes in the human organism which lead to death are the processes which make man what he is. As to why we grow old, many answers have been given. Metchnikoff's theory of an auto-intoxication from the large intestine is familiar to most of us; others refer senility to mere wear and tear. None of these theories are of

universal application, and all fail to answer another question—Why do not all animals exhibit the perfect recuperation to which some have attained? Some worms have the capacity for periodically becoming young again. Thus, a Planarian may separate off a third of its body, which speedily grows into a whole, while the diminished original heals itself and grows a new tail. This process synchronizes with an increased metabolism and an increased power of resistance to poison vapours. Assuming these to be qualities of youth, then the regrowing fragment is again young. Similarly, we all know that ascetics and people who are spare in their diet often become curiously young in appearance. These are facts which suggest that creatures become younger in whole or in part by lying low for awhile, and that herein may be the clue to those curious processes of dying-back which occur during the hibernation of some animals and the winter changes in plants or trees.

These thoughts, arising from the many signs of spring, suggest a speculation that possibly the very early pre-differentiation stage of embryonic life in some complex organisms, where the individual is known to fail in evading senescence, may afford opportunities for rejuvenescence at the very start of life and a lessened risk of being born old. One draws from such an idea no dream of an *elixir vitæ* being extracted from an embryonic tissue; but it encourages the view that while habits age us, new work, new play and even new diet are but means of showing man that he is as young as his mind is, though he may be as old as his arteries. In any case, our efforts to stave off senescence may be rewarded by an evasion of senility, even though we find it difficult in these spring days to be either as gladsome as the finches or as rejuvenant as the newly-gilded larch or the freshly-purpled birch trees. If human life were longer, we might in time grow so used to the signs of spring's return that they gave us little pleasure; but although time flies quicker in later life than it does in childhood, a year remains a sufficiently large fraction of our whole experience for spring to keep for us until the end all its earliest fascination, and make us see the incongruity between what we are and what we might be. Perhaps, to enjoy fully the Lenten lilies of spring we must come to them with the spirit of Lent, but this is not given to us all.

Next, a turn in my walk brings me to a giant elm torn up and flung across the path. It is the aftermath of a recent gale, and near by, too, is a hornbeam resting against another with all the suggestion of a wounded man supported by a comrade. It is a picture of death in life and a reminder of those human derelicts who, but a mile or so away, are the piteous fruit of that other blizzard, a blizzard of iron and lead which sears, scorches, breaks and maims. It is difficult to suppress sad and suggestive thoughts, and yet the havoc wrought by Nature and by the fury of man will be repaired. But what years must pass by. Generations must come and go before another elm of the girth of that before me rears and holds its head. So, too, all those whose hearts are wounded by the red ruin of this war must pass to the great place of reunion ere mankind forgets the

anguish of this kind. None of us who are now alive will see it, but by the eye of faith. For us, it suffices to know that it will be, and we once more realize the unimportance of our own little span in the "unfathomable sea whose waves are years."

IX.

Returning from leave, I was sitting in the train just before its departure, noting the varied groups of people who had come to say good-bye to friends and relatives. Just outside my carriage were a couple who attracted my attention. They were a young pair and it was obvious that to both the parting was momentous. It was difficult to avoid hearing some of their words; the woman begged the man to take care of himself, not to be reckless, to remember all he was to her and the value of his life to others in the particular business of his life. What his reply was I did not hear, but doubtless the usual promise of a due regard for self-preservation, subject to the prior call of duty and honour. The whole incident was pathetic, and but one of many of the kind which have been enacted for many months on many railway platforms. The man got into his carriage and the train moved off. During the journey down to Folkestone, I found myself thinking of it all and recalled a farewell of my own and of my family to a fine young man at Peshawar city station, where he had come to say good-bye to us. It all came back, his cheery smile of confidence and deprecation at our parting bidding to take care of himself, if only for the sake of one of us. And then came the remembrance of the sequel, for he was killed in action within three months, whilst rescuing a wounded officer. It was difficult to avoid sad thoughts and serious reflection.

As I sat musing, the paradox presented itself that we wish or will for those whom we like and love that which we would prefer them never to will for themselves. Because the woman loved her man and I liked my friend we each willed their safety. If those two men had willed their own safety as ardently as the woman and I had wished and willed it on their respective behalfs, would they hold the same place in our estimations and be our heroes? One doubts it, and realizes that had they said, "I will take good care of myself for I perceive the loss you all would suffer if harm came to me," we should have felt in gaining our desire we had dishonoured the object of it. The fact is, the woman on the platform loved her man and I liked and gloried in my friend because we knew that each of those men despised or held at its true price the safety in which we would keep him. Both the woman and I had willed for our respective friend that which, when he willed it for himself, deposed him from our reverence and affection. We are here confronted with the fact that the view we take of our beloved or liked and the view our beloved or liked takes of itself are different. To us, the beloved must be preserved, but the beloved are not concerned with self-preservation and reserve for themselves a recklessness which we, on their behalf, would forbid.

It presents an interesting situation, and the difficulty is not lessened by our being obliged to admit that the safety which the woman and I desired

for our friends was not the last word of our minds, but that there is or was in us both an inward, deeper, subconscious will which consents to their sacrifice of themselves. In my own case, that subconscious will whispers now to me that had my dear dead friend hesitated to make the sacrifice, I should have reverenced him less. I do not know the subsequent history of the woman's man, but one is confident that, should he fail in making the great renunciation, her mental attitude would be similar to my own. If so, then the wills of our two friends were and are the same as that of the woman and myself. Even admitting this, a difficulty arises that when the woman and I have gone over to the side of our respective friends and consented to the temerity which destroys them, our other will, or the will for their safety and preservation, is not extinguished. It continues to utter a protest. Another argument comes along which says, that the sacrifice of the noblest and the best is a necessary factor in the progress of the world. To this the question arises, How many victims does the world require? Are there no limits and can self-sacrifice never be over-done? May not my friend have represented one more than was necessary and are the right ones always selected? To understand why the whole creation must suffer pain is not enough to reconcile us to the sorrow that actually exists. We must be satisfied that there is not one groan too many or too few, not one mistake in the persons selected for sacrifice nor in the time allotted for their pain. Between the abstract truth that someone must suffer and the concrete fact that my friend and no other has suffered, here is a wide gulf. Though convinced of the first, I am not reconciled to the second. Of the two wills within me, that which decreed the safety of my friend is far more assertive and argumentative than the other will which consented to and approved of his self-exposure to risk. If we ask a man why he risks a valuable life like his own, his reply will be, "I cannot do otherwise." If we turn back to ourselves, we find that this also is the attitude of our own second or subconscious will, and we say to ourselves 'I cannot do otherwise than consent to the course he has taken." This brings us back then to the conclusion that, after all, my will and the woman's will were at one with my friend's will and her friend's will. Further, the conclusion is unavoidable that neither the woman and I nor our respective friends decided the question for ourselves. The decision had been decided by some Third Party, which we may call conscience or anything else we please. Much the same difficulty doubtless worried the Apostle when he asked himself why he in particular, and not one of the other Apostles, should have been selected as chief ambassador to the Gentiles. It is difficult to avoid making the same answer in our own case as St. Paul did, and say, "By the grace of God I am what I am." The truth seems to be that we have little say in the making of these decisions, and that is why we must and do say so little as to why and wherefore. There is comfort in the thought, because it confirms the presence of the power within us of a beyond-self, and it explains the instinct we possess that it is good to give all when a higher than self demands it.

REPORT OF A BASE LABORATORY IN MESOPOTAMIA FOR 1916, WITH SPECIAL REFERENCE TO WATER-BORNE DISEASES.

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The following is a short account of the results obtained in the laboratory at —— British General Hospital, dealing with the diseases prevalent in Mesopotamia among the troops during 1916. A few brief remarks as to climate and general considerations may be of service to a preliminary understanding of the prevailing conditions there.

The months of January, February and March constitute the period of the rains. During the whole of this time the river is rising, and continues to do so until about the middle of May, after which it gradually falls, the lowest level being reached by about the middle of October. During the first three months the temperature is never very high during the day time—the average daily maximum being about 66°, 70°, and 78° F. respectively for these months. There is a considerable drop at night, though it is rare for the thermometer to fall much below 40° F. April to September constitutes the hot weather period, the average daily maximum being highest during July. In July, 1916, this daily average, taken under the prescribed conditions of shade, etc., was 110, but under the conditions in which men frequently lived, it was certainly much higher.

The first part of the hot weather is characterized by great moisture, partly owing to the large amount of flooded country produced by the swollen river overflowing its banks, and partly to the frequency with which the wind is in a southerly direction at this time. About the middle o June the prevailing wind changes to the north, causing great improvement in the climatic conditions, and continues fairly regularly from this quarter for six weeks or more. In 1916 this north wind was late in its arrival, and did not commence to blow until the end of the third week in July.

Flies begin to multiply in March, and become a great pest in April and May, then disappearing rapidly as the heat increases.

The low-lying swampy ground provides a breeding place for mosquitoes although, as pointed out by Major Christopher. I.M.S., owing partly to its being tidal, and from other causes, it is not as well adapted to this purpose as might at first sight seem to be the case.

Under these conditions it is not surprising to find that malaria and the water-borne diseases should account for such a large part of the sickness

among the troops. The latter group showed a steady increase from March onward, reaching a maximum in July and August.

The great bulk of the material sent for examination was supplied by this hospital; a certain amount, however, came from other units in the vicinity not supplied with fully equipped laboratories. This was chiefly of the nature of blood cultures and agglutination reactions.

Enteric Group Diseases.

A chart showing the monthly incidence of enteric group disease, as diagnosed by blood culture in this laboratory, is shown at the end of this section. Although over 650 cases have been diagnosed by all methods during the year, only 21 per cent were found to be true typhoid, while 65 per cent were due to *Bacillus paratyphosus* A.

As far as we can determine, paratyphoid B fever had not been diagnosed in this country prior to the arrival of the —— Division in March. We (K.B.) had not isolated the organism, and had failed to find agglutinative evidence of its presence in the blood; and we believe our predecessor had met with a like result. On the arrival of the —— Division many cases of enteric and both paratyphoid fevers were admitted from the transports, and, apart from agglutinative evidence, *B. paratyphosus* B was isolated by blood culture on two occasions during this month from among these cases.

It would appear that an orderly nursing in the paratyphoid ward of this hospital was the first case of paratyphoid B infection arising in this country to be diagnosed as such. During April a few cases (five) continued to be diagnosed, and an increase occurred in May which reached its maximum in June. In fact, more than fifty per cent of all the cases diagnosed occurred during these two months, blood cultures being positive on several occasions. Since then the organism has never been isolated from the blood, and its incidence, judged by agglutination tests, has fallen to four or five cases a month. Nearly all of these latter came from the Euphrates area. The rise of paratyphoid A fever during the hot weather, reaching its maximum in September, is also shown on the accompanying chart.

Investigation was carried out under three headings:—

(*a*) Isolation of the organism from the blood.

(*b*) Isolation of the organism from the stools.

(*c*) Agglutination reactions.

Urine was only examined on five occasions with a negative result in each case. Blood cultures have been made systematically on all possible cases. None were made in January or February, as no acute cases in early stages of the disease were seen then.

Stool examination was commenced in January, and carried on intermittently until the end of April. During the hot weather it practically ceased, and was resumed again at the beginning of October. It has never been done systematically in all cases, but was chiefly relied upon in those seen too late for blood culture, in which agglutination reactions were likely to be modified by reason of inoculation with T.A.B.

Agglutination reactions were performed on all cases not coming in previous groups.

Blood Cultures: Technique.—Five cubic centimetres of blood were withdrawn from a vein and inoculated into ten cubic centimetres pure ox bile. This latter could always be obtained from the slaughter-house, and proved a very satisfactory medium. As a general rule, blood was not taken before the fourth day, nor after the tenth. Relapses, in cases not previously diagnosed, were made an exception; and in many such a positive result was obtained late in the disease.

After incubation for twenty-four hours, and at the end of every subsequent twenty-four hours for four days, subcultures were made into mannite peptone water. As soon as evidence of acid formation was seen, an agar slope was inoculated from this tube, and also a broth tube. This was examined for motility, and the slope was emulsified at the end of twenty-four hours, and tested against high titre serum in dilutions up to 1 in 800 or 1 in 1,600. Usually a dilution of 1 in 800 with the serum was considered sufficient.

Identification was thus based on:—

(1) Reaction and amount of gas, if any, in mannite tube.

(2) Character of growth on agar and motility.

(3) Reaction to specific serum.

At first other sugars were used, but the purity of some of them was not above suspicion, and for the identification of an organism isolated from the blood-stream, their use was not deemed essential as a routine measure. The high titre serum was of Lister Institute manufacture, and was the ultimate criterion of specificity. It was kept in the ice-chest during the hot weather. The sugars, dulcite, lactose, glucose, and salicin were employed if any irregularity was observed in (1) or (2), or if complete agglutination in dilution 1 in 800 did not occur in two hours at 37° C. If excessive gas was observed in the mannite tube, or early formation of gas, plating on MacConkey was always done to avoid masking of E. group organisms by contamination.

The behaviour of the paratyphoids in mannite peptone water differed markedly. As a rule *paratyphosus* B formed acid and gas vigorously—usually to the extent of about one-third of the Durham tube in twenty-four hours.

Of ninety-five strains of *paratyphosus* A there was no gas formation at all in twenty-eight. In sixty-four, there was slight gas formation at the end of twenty-four hours, very often merely a bubble. At the end of forty-eight hours this would have increased to about one-third of an inch. Two others showed marked gas formation, and in one the gas more than half filled a Durham tube. These latter gave the ordinary fermentation reactions of the group.

A certain number of anomalous organisms were isolated from time to time, which could not be referred to any group, although from the delicate

nature of the growth and other reasons, they did not appear likely to be contaminations. Two were submitted to Parel Laboratory for animal inoculation and further report, and a good many others could not be worked out for want of time.

In four cases organisms giving all the sugars reactions of the paratyphoid group were met with, but which did not agglutinate or only did so very slightly. The figures dealing with positive results do not include any of these. On one occasion hæmoculture yielded an organism of *Fæcalis alcaligenes* group.

At the beginning of October, it was arranged to issue for blood cultures small sealed bottles of ox bile to other units on application. The result was communicated by telephone, but percentage of positive results compared with those done in this hospital has been very small. This may in part be due to bad selection of cases by medical officers, but may also be accounted for by delay in reaching the laboratory.

	B.G.H.	Other sources	Totals
Total number of cultures made ..	352 ..	32 ..	384
Positive to *B. typhosus*	21 ..	1 ..	22
,, *B. paratyphosus* A ..	93 ..	3 ..	96
,, *B. paratyphosus* B ..	7 ..	0 ..	7

Inagglutinable strains resembling paratyphoids in all sugar reactions, 4; and *B. paratyphosus* B more closely in respect of gas formation.

The figures show that 32·6 per cent of positive were obtained of all cases, whereas taken separately only 12 per cent of outside cases yielded positive results as against 34·4 per cent of cases from this hospital.

The relative incidence of the members of the group deduced from these figures is: T., 17·6 per cent; A, 76·8 per cent; B, 5·6 per cent. The figures for paratyphoid B are low when compared with the agglutination results. It is probable that the inagglutinable strains, had it been possible repeatedly to subculture them and test them against the serum, would have been found to agglutinate and should also be included among them.

Further, the shorter duration of the bacillæmia in paratyphoid B infections compared with *B. typhosus* and paratyphoid A infections has been reported upon, and in cases received at the end of the first week or later, for this reason alone the diagnosis of the infection by blood culture would not be on all fours with diagnoses made in the same way in the case of other members of the group.

Nevertheless the duration of the bacillæmia, speaking of the group generally, is in some cases strikingly long, and in most cases would appear to last well over a week.

Analysis of 87 cases of continuous fever, all yielding a positive blood culture of an enteric group organism, gives the following result.

Day of disease:	3	4	5	6	7	8	9	10	11	13	15	19	30
Number of positives	1	6	12	12	18	16	9	8	1	1	1	1	1
Percentage of total blood cultures	16·5	40	28	25	36·7	37	25	29·6					

During relapses successful cultures were made on the sixteenth, twenty-first, twenty-third and fortieth days of illness, and in a few other cases in which the duration of the illness was uncertain.

In one case *B. paratyphosus* B was isolated from the blood and *B. dysenteriæ* Flexner from the stools.

Stools.—The difficulties in the way of systematic stool plating were considerable, principally owing to the climatic conditions. Apart from the fact that media for plates all had to be prepared and sterilized in the room where microscopic work was going on, thus adding considerably to the already high temperature, large quantities of medium could not be prepared as moulds, etc., grew very rapidly. For three months, plates would not set unless placed in the ice-chest, already overcrowded, and of construction not ideal for the accommodation of a plate level in the presence of rapidly melting ice. When ready, plates had to be used the same day to give good results and the fitting in of the preparation of the plate with the arrival of the stool at the laboratory frequently left much to be desired. As a result, the method was only followed in a few special cases, reliance being placed on blood culture and Widal tests for the diagnosis of members of the enteric group.

Of 108 examinations, *B. typhosus* was recovered five times and *B. paratyphosus* A eleven times. *B. paratyphosus* B was never isolated.

Technique.—At first the time-honoured method of direct plating on MacConkey was used. Subsequently the modification of Browning's original brilliant green method as recently described by Leitch (*Brit. Med. Journ.*, September, 1916) was tried. The difficulty here seemed to be to hit off the right length of time in which to allow the brilliant green to act before plating. Varying periods of from ten to twenty hours were tried without much obvious advantage, and finally direct plating on MacConkey was again reverted to. It would appear in any case that the method is best suited to a search for *B. paratyphosus* B, too great inhibition being exerted on the more delicate growing *B. paratyphosus* A. At the end of twenty-four hours, suspicious colonies were fished, examined for motility, and the sugar reaction tested. The specific serum test was then applied as for organisms isolated from the blood.

Agglutination Tests.—The bulk of E. group cases have been diagnosed by this method. Although admittedly the least desirable means, this was only to be expected in a hospital receiving so large a number of its cases from up-river, and relatively so few direct admissions. In these late cases, recovery of the organism from the stool or urine is the only alternative, but the difficulties in the hot weather and the length of stay in hospital required, frequently renders such search impossible. Recourse therefore must be had to agglutination tests, and in T.-inoculated persons the error is probably not very great—perhaps ten or fifteen per cent. In such cases, marked agglutination to either A or B has been taken as presumtive evidence of infection by the corresponding organism, even if the T. titre was also high. The possibility of mistaking a true T. infection for A or B

under these conditions would appear remote, since it is generally agreed that T. infection produces as a rule little group agglutination for A or B, whereas in A or B infections usually the first noticeable change is a rise in the titre to be *B. typhosus*. It is much more necessary therefore to be on guard against diagnosing as a T. infection one which is really due to A or B, the true nature of the case becoming apparent later on by the appearance of agglutinins for these organisms, generally by the end of the third week.

In this way diagnoses made by us on the presence of fairly high T. agglutinins during the second week have in a certain number of cases been altered after subsequent agglutination tests have been performed. It is probably inevitable that a certain number originally so diagnosed have escaped further observation and have helped wrongly to swell the typhoid agglutination figures, although possibly not many, as a comparison of percentages with blood culture percentages will show. The short stay in hospital of many cases received from up-river prevented multiple agglutination tests being done as a routine measure. It was done however in a great number of cases, if considered necessary. In uninoculated persons and in a *certain number* of T.-inoculated persons it was thought that one Widal would suffice, if taken sufficiently late in the disease. A difficulty was met with occasionally when successive agglutination tests showed progressively increasing titre to all three organisms. In some of these in which the B titre was a good deal higher than that of A a diagnosis of paratyphoid B was made; but generally, in such, no attempt was made to diagnose specifically. Even in these cases such agglutinations are at least sufficient to indicate the presence of E. group disease.

To warrant a diagnosis of true typhoid in a T.-inoculated person, we required a high or rising titre to T. with none to A and little or none to B. With the method used, a titre of 1 in 320 was generally considered sufficient unless inoculated within eight or nine months.

The recent extensive introduction of T.A.B. has greatly impaired the value of agglutination tests in our opinion. In the majority of such cases it would appear impossible to attempt an accurate diagnosis by such means, except possibly by an elaborate series of tests, spread over a considerable period of time. At a base hospital on active service this is not practicable.

Stool examination, uncertain as a means of detecting the "carrier," is even more uncertain as a means of diagnosing large numbers of acute cases during a rush of work.

In this connexion it may be pointed out as a causal factor that whereas the suspected convalescent "carrier" can be purged with impunity, a like freedom of treatment is seldom desirable in patients during the acute stages. In the latter case one has to work with stools that may have lain in the large intestine many hours, obviously detrimental to a successful result.

Possibly more energetic hæmoculture in all suspected early cases may help in part to solve future difficulties in diagnosis.

Agglutination Technique.—The strains used were all reliable ones. Two were brought from France and the third was obtained from India. Carbolized agar emulsions were made from subcultures, and retained their agglutinability through the hot weather. At the beginning of September the *paratyphosus* A strain died out, and so all three were replaced by strains brought from Egypt by Lieutenant-Colonel Ledingham and which had been used there as standard. These have remained in use since with satisfactory results.

In performing the tests, the dilutions were made on a glass plate ruled with grease pencil, then drawn up into lengths of glass tubing of bore about three millimetres and incubated for eighteen hours at 37° C. when the reading was made, using a + 12 lens.

The total number of agglutination tests made during the year was 1,283, and the number of diagnoses made 520 or 40 per cent. Of these 520, enteric fever accounts for 113 = 21 per cent, paratyphoid A for 326 = 62 per cent, and paratyphoid B for 82 = 16 per cent.

Inoculation.—Details of inoculation have been kept on all cases investigated during the year and a glance at the results is of interest. Only those dealing with cases in which the organism was obtained from the blood will be considered.

1*st Series.*

PATIENTS EITHER INOCULATED OR UNINOCULATED WITH OLD T.V.

B. typhosus ..	Never inoculated	21	
	Never or more than eighteen months ago	16	22
	Inoculated within eighteen months ..	6	
B. para. A ..	Never inoculated	18	
	Never or more than eighteen months ago	30	
	Within eighteen months	49	83
	Not stated	4	

In the above cases, the inoculation is either definitely stated to have been T.V. or took place at such a date that would exclude the possibility of T.A.B. Apart from the fact that cases of enteric fever only form 20 per cent of the total, it shows that of these only 27 per cent had received inoculation within one and a half years, and 50 per cent had never been inoculated at all; remarkable figures when it is considered how greatly in British troops the inoculated must outnumber the uninoculated, and therefore the correspondingly greater number of the former who are exposed to infection.

In cases of *paratyphosus* A, against which it would hardly be expected to give any protection, the incidence among the inoculated and uninoculated is seen to follow this "mass" factor just referred to, in the proportion of sixty-one to eighteen.

Figures for T.A.B. are of course only available over a short period. I give figures of all cases diagnosed by blood culture since September 1. The total number of these is fifty-three, and includes a certain number of T.-inoculated individuals already dealt with under that section.

2nd Series.			
B. typhosus	Never inoculated or not within eighteen months ..	7	
	Inoculated T.V. within eighteen months	2	9
	Inoculated T.A.B.	0	
B. para. A	Never inoculated or inoculated with old T.V.	31	
	Inoculated T.A.B. within six months	10	44
	Inoculated in May and June, 1916, most probably T.A.B.	3	

These figures deal with small numbers of course, but inasmuch as they are based on blood cultures they are accurate; and if they show anything they show the protective value of the old typhoid vaccine.

With regard to T.A.B., if its value be as great, it is a little surprising to find the incidence of *paratyphosus* A so high in men inoculated within six months of the onset. As a matter of fact nearly all these cases occurred within four months of inoculation, and some a good deal less than this.

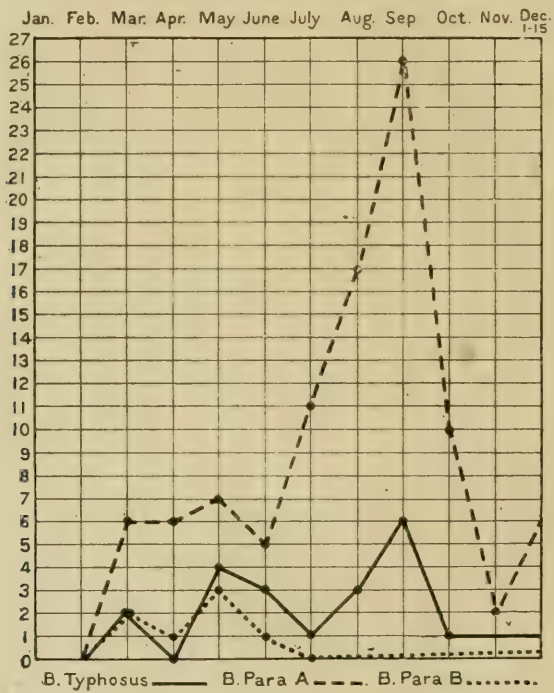

Chart showing the monthly incidence of enteric group disease by blood culture.

SUMMARY OF ENTERIC GROUP.

Total number of cases diagnosed: January 1 to December 31, 1916 .. 661 { T. .. 139; A .. 433; B .. 89

Organism isolated in 141:—

Blood .. 125 { T. .. 22 = 17·6 per cent total positives = 5·7 per cent total cultures.
A .. 96 = 76·8 ,, ,, ,, = 25 ,, ,, ,,
B .. 7 = 5·6 ,, ,, ,, = 1·7 ,, ,, ,,

Stools .. 16 { T. .. 5; A .. 11; B .. 0

Diagnosed by agglutination:—

520 { T. .. 112 = 21 per cent total positives = 8·9 per cent total agglutination.
A .. 326 = 62 ,, ,, ,, = 25·4 ,, ,, ,,
B .. 82 = 15·4 ,, ,, ,, = 6·3 ,, ,, ,,

Cholera.

Cholera was first noticed among the troops towards the end of April. Four or five suspected cases arrived at this hospital from up-river on April 30. A hasty microscopic examination of the stools, all of typical appearance, showed the presence of vibrios having the morphological character of cholera ; a provisional diagnosis was made and the cases were transferred to a section of the isolation hospital prepared for them. From this time on, there was a steady stream of cases during the hot weather. The outbreak never reached alarming proportions and gradually died out by the end of September.

Incidently, a mortality of about forty per cent was recorded.

A large number of stools were examined in May and June (about 120) for *V. choleræ*, many of which were positive, but unfortunately the records have been lost. Since then seventy-one stools were examined with positive results in twenty-eight. In forming a positive diagnosis, the following points were taken into consideration :—

(1) Naked-eye appearance of the stools.

(2) Characters of smear stained with dilute carbolfuchsin, i.e., presence of vibrio forms, presence of spirochætes (*S. eugyrata*), etc. Although the circumstances of the occurrence of the latter in the stools are but imperfectly understood, in actual practice it was found that in smears showing them a vibrio could generally be isolated in peptone water from the stools. Stools containing them were therefore regarded with grave suspicion, and a report given accordingly before waiting for the result of culture.

(3) Culture in peptone water and examination of the top layer for vibrios after eight to ten hours' incubation. The use of Witte peptone, of which we always had a supply, was found invaluable in this connexion, and frequently gave positive results when other good peptone, although sugar-free, was negative. The formation of a surface pellicle did not seem to be very constant.

(4) Reaction against specific high-titre serum. This was always done microscopically by hanging drop. Immediate complete agglutination in dilution of 1 in 200 or 1 in 400 was taken as positive.

(5) Cholera-red reaction. This was done on every case at first, but was later given up owing to its uncertainty in cases which otherwise conformed to type. The hæmolytic test was not done in any case.

Of the twenty-eight cases in which a vibrio was isolated, twenty-two were diagnosed on the growth of a vibrio in peptone water, which was morphologically *V. choleræ*, and which was agglutinated in the manner specified. In the remaining six no agglutination occurred.

The Dysenteries.

Whether or no amœbic dysentery is endemic in this country we do not know, yet certainly it has been responsible for a great deal of sickness among the troops here throughout the hot weather. Of even commoner

occurrence has been the bacillary form of the disease according to our own figures. Speaking generally of cases with dysenteric symptoms, the maximum of the curve of incidence was reached in August and September, as in the case of enteric group disease, after which it gradually fell again.

It is to be regretted that these cases were not examined systematically from the beginning, but pressure of work and the trying conditions of heat prevented this. A small number of stools were plated (fifty-nine), all of them containing blood and mucus. *B. dysenteriæ* Flexner was isolated in seven, and *B. dysenteriæ* Shiga in two. Microscopical examination of eighty stools also containing blood and mucus showed *E. histolytica* in eleven.

By the addition to the laboratory staff of Captain Crossman, R.A.M.C., and Lieutenant Boulenger, a detailed examination of all cases became possible. This was undertaken at the instigation of the Medical Advisory Committee, and was commenced in September. The protozoological findings were the work of Lieutenant Boulenger, and a short account of the work is appended by him.

In this way the stools of 890 cases of intestinal disorder were investigated during the last four months of the year.

These cases fall into two groups :—

(1) Cases of acute dysentery.

(2) Cases in which some diarrhœal symptoms were present, and in which there may or may not have been a history of a previous acute dysentery.

This latter group doubtless included a great many cases of ordinary simple diarrhœa.

The method adopted was briefly as follows :—

(1) Microscopical examination was first made on every case, and the protozoological findings noted.

Those containing blood and mucus (i.e., group I, acute dysentery), and not showing the presence of *E. histolytica*, were then plated.

(3) Stools containing no blood or mucus were not plated.

This was the general procedure, from which there were a few exceptions made.

(*a*) A small number (twelve) containing blood and mucus, in which *E. histolytica* had already been found, were also plated.

(*b*) Nineteen stools containing no blood or mucus were plated.

The results obtained will be considered according to this grouping :—

Group I : Acute dysentery, i.e., cases passing blood and mucus in stools. The number of such cases was 309.

Microscopic Examination.—E. histolytica 80 = 26 per cent. These are considered in the section dealing with the prozoological findings. Of the remainder 209 were plated with the following result :—

B. dysenteriæ ..	Shiga	65	= 108
	Flexner	38	
	Shiga and Flexner	5	
,, ,, ..	Negative	101	

Thus 108 cases, or 51·7 per cent of those submitted to bacteriological examination, were proved to be due to infection by *B. dysenteriæ* ; and the relative incidence of the two forms of the disease will be : amœbic 26 per cent, bacillary 35 per cent, of the total number of cases examined.

Two cases of mixed amœbic and bacillary infection were noted, viz., (1) *E. histolytica* and *B. Shiga* ; and (2) *E. histolytica* and *B. Flexner*.

There still remains 39 per cent of acute cases in which the causal agent was not determined. A bacillus of the Morgan No. 1 group was isolated once, but it is possible that if repeated examinations had been made a certain further proportion of these undiagnosed cases would have been cleared up. "Repeat" examinations for protozoa on negative cases were made a great number of times, but it was of very rare occurrence that *E. histolytica* was noted in any of these subsequent examinations. On the other hand, only twelve cases were plated a second time, the first occasion being negative, and in three of them a bacillus was isolated (Shiga). We are, therefore, inclined to think that the undiagnosed cases were chiefly of bacillary nature, either due to one of the recognized strains which a subsequent plating might have revealed, or else caused by other bacillary agents of hitherto unrecognized specificity.

From an examination of the above figures, the Medical Advisory Committee reported as follows :—

"It is thus apparent that bacillary dysentery is the predominant type in the Mesopotamian area (as in other war areas), and there is little doubt that, had the cases investigated been in the main local admissions instead of transfers from up-river, the proportion of bacteriologically proved bacillary cases would have been still higher."

Technique.—A small portion of mucus was emulsified in sterile saline, and a couple of large loopfuls transferred to a MacConkey plate, a piece of capillary tubing bent at right-angles being used as a spreader. After eighteen to twenty hours' incubation suspicious colonies were picked off, about three from each plate—and each one inoculated into mannite peptone water and broth. The broth tube was examined for motility, and an agar slope was inoculated from the broth or mannite tube, if no gas formation had taken place in the latter. The following day the agar slope was emulsified and tested against high-titre serum.

The inoculation of a broth tube was frequently omitted later on, as it was found that examination of the mannite tubes for motility could be relied upon, if not done later than eight or nine hours after inoculation. In the case of the non-acid forming Shiga group, the examination could be made as from a broth tube.

The reaction against specific high-titre serum was done macroscopically in every case, using the technique adopted in all other agglutination tests, and already described. The titre of the serum was rarely higher than 1 in 1,000 and was frequently not more than 600 or 800 ; and it was always found to give more marked agglutination against organisms of the Shiga group than against those of the Flexner group.

Complete agglutination in a dilution of 1 in 200 at 37° C. was accepted as positive in the case of an organism which otherwise satisfied the requirements. In the majority of cases tried, the organisms have agglutinated up to the full titre of the serum, especially those of the Shiga group.

The sugar reactions at first, after the primary differentiation by mannite, were not fully investigated. A great many later strains, however, have been kept and the sugar reactions tested against glucose, maltose, saccharose, inulin, dextrine and lactose, and subsequently against dulcite, salicin and adonite. Organisms of the Flexner group all produced acid in mannite, maltose and glucose, usually in twelve hours, and remaining acid up to five to seven days, after which observation ceased. In dextrine, acid formation was usually slight though definitely present. Most of the strains tested produced acid in saccharose within twenty-four hours. One subsequently became neutral, and in two more no change took place at all; in lactose there was no change, nor in salicin, inulin, adonite and dulcite.

Of the Shiga group, all produced acid in glucose, in maltose, acid at first becoming neutral after four or five days, or less definitely acid; in saccharose, usually no change, but acid formation took place in two at the end of twelve hours; no change in mannite, lactose, dulcite, salicin, inulin, dextrine and adonite.

A certain number of strains were obtained in which agglutination was incomplete, very slight or absent. Some of them were put through other sugars, glucose, maltose, saccharose, and dextrine, but whether they conformed to type in these reactions or not, they were not regarded as true strains. In such cases, a diagnosis of "bacillary dysentery" (mannite-fermenting group), or the reverse, was returned. None such are included in the above figures. The medium used for plates was MacConkey; Conradi-Drigalski was used earlier in the year, but was given up in favour of the former.

Group II: Chronic dysentery and diarrhœal conditions, i.e., stools containing no blood or mucus.

It has already been mentioned that nineteen stools containing no blood or mucus were plated.

They were all negative.

Protozoological Findings in Groups I and II.

From the beginning of September, 1916, onwards the stools of all patients suffering from dysentery and allied intestinal disorders were examined for pathogenic and other protozoa; this section furnishes a preliminary account of the findings from that month to the end of the year.

During this period nearly 1,300 stools were dealt with, representing 890 separate cases—all British patients.

With few exceptions the cases were patients resident in the hospital; a uniform method of collecting specimens was therefore found desirable and was briefly as follows:—

Bed-pans containing the fæces were taken by the ward orderlies to a small shed conveniently situated and set apart for the purpose. The contents were inspected at intervals during the day and the macroscopical characters—presence or absence of blood or mucus, colour, consistence, etc., noted. Small samples were taken to the laboratory in corked tubes and examined microscopically before being passed on to the bacteriologists. By this method perfectly fresh specimens were dealt with, this explaining the rather high percentage of free living organisms, e.g., free amœbæ and flagellates, observed.

Smears from the fæces were examined in salt solution (warmed to blood temperature when necessary during the winter months) and Weigert's iodine solution, according to the method recommended by Lieutenant-Colonel C. M. Wenyon, R.A.M.C., in his recent publications on the subject.

Entamœba histolytica.—Of the 890 cases examined 142, or approximately 15·9 per cent, were found to be passing the pathogenic *E. histolytica*, either in the free living or encysted condition.

The 890 cases naturally included a large number of convalescent dysentery patients as well as a few cases of simple colitis and diarrhœa; the acute cases of dysentery (i.e., in whose stools pus cells and red blood cells were found) numbered 309 and *E. histolytica* was found in 80 of these.

It is therefore possible to state that over a quarter (25·9 per cent) of the acute dysenteries at this hospital during the last four months of the year were of amœbic origin.

Non-pathogenic Amœbæ.—The non-pathogenic *E. coli* was met with in 162 cases, or about eighteen per cent of the total number. The only other parasitic amœbæ noted were small forms of the *limax* type which occurred in four cases; these are probably to be referred to the species *E. nana* recently discovered by Lieutenant-Colonel Wenyon in Egypt.

Flagellates.—Lamblia (*Giardia*) *intestinalis* was found to occur frequently and was recorded in eighty-eight, or nearly ten per cent of the cases; the pathogenicity of this species has been much discussed; there seems, however, little doubt that certain persistent diarrhœas were due to its presence in the intestines.

Trichomonas intestinalis and *Tetramitus* (*Macrostoma*) *mesnili* were also occasionally met with, occurring in 8·1 and 5·7 per cent of the cases, respectively.

Coccidium.— A *coccidium* of the *isospora* type was found in seven cases; no special symptoms of coccidiosis were, however, noted in any of these.

TABLE SHOWING THE OCCURRENCE OF PARASITIC PROTOZOA IN 890 CASES OF INTESTINAL DISORDER.

	Number	Percentage
Entamœba histolytica	142	15·9
,, *coli*	162	18·2
,, *nana*	4	0·45
Lamblia intestinalis	88	9·9
Trichomonas intestinalis	72	8·1
Tetramitus mesnili	52	5·7
Coccidium (*Isospora* sp.)	7	0·8

Malaria.

In January benign tertian parasites were found in only 11 cases and subtertian in 1, out of a total of 90 examinations. An increase was not noticeable until May when the number of examinations had risen to about 150 with about sixteen per cent positive. In July, 50 positives were recorded among a total of 248 and of these 44 were benign tertian and 4 subtertian. The remaining two appeared to be the quartan variety, a marked chromatine band being present.

Subsequently to this, the level remained fairly constant with a slight drop in August. In November the subtertian had increased and were in the proportion of one to three of all cases diagnosed.

For the months January, February and July to December 15, i.e., seven and a half months, the total figures are 1,477 examinations with 260 positive = 18 per cent. Of these 260, 40 = 18 per cent were subtertian. Actual figures for the remaining months, March, April, May and June are not available. The monthly average was 200 per month with seventeen per cent positive. The total number of slides thus examined was between 2,200 and 2,300 during the year.

Relapsing Fever.

Forty-seven cases were diagnosed by finding spirilla in the blood. All of these cases except two arrived with the —— Division from Egypt and were men of the —— Regiment who had all travelled together in the same ship to Mesopotamia. The two cases excepted were officers who had been doing duty at a Turkish prisoner's camp, where a good number of cases had occurred among the prisoners. Only one case terminated fatally. Strict isolation and disinfection of kit succeeded in limiting the epidemic to this one regiment, and in eradicating it in less than a month. Apart from this outbreak, *S. recurrentis* was not reported in this laboratory during 1916.

Jaundice.

Blood cultures were done on five cases of jaundice with low pyrexia. All were negative.

Cerebrospinal Fever.

The meningococcus has been found in the cerebrospinal fluid of six cases, one of which occurred outside the hospital (Civil Surgeon's case). It could not be cultivated on blood-smeared agar on any occasion, although once or twice it was present in enormous numbers.

In every case the diagnosis was based upon the polymorphonuclear nature of the exudate, and the presence of a Gram-negative diplococcus morphologically resembling the meningococcus, a certain number of which were inside the cells.

During October, the throats of fifty-one healthy N.C.O.s and men of the Australian Wireless Section were examined for the presence of the meningococcus, with negative results.

Diphtheria.

This disease has not been of unfrequent occurrence. Altogether twenty-two cases have been diagnosed, but the majority of these have been in men of the same regiment and occurred during August and September. During the hot weather, when serum media were difficult to prepare, and still more difficult to keep, many successful inoculations were made on the white of a recently hard-boiled egg inverted in a urine specimen glass containing a little water to keep it moist. While not growing quite so readily as on serum, this method proved of considerable practical value.

Oriental Sore.

Although smears from scrapings of suspected sores have been examined from time to time, no Leishman bodies have been seen in any of them.

Plague.

Only on one occasion has material been sent to the laboratory from a case of suspected plague and the report was negative.

A certain number of rats have been examined however, thirty-eight in all, since the middle of October. Only one of these was caught in a trap. The others were either killed by sticks, or shot, with the exception of two which were found dead. (A great many others, not included in the above, were found dead, but were too mummified or decomposed to permit of satisfactory examination.) Six of the thirty-eight showed plague lesions, and were seen by the officer on special plague duty, Major Kunhardt, I.M.S. *B. pestis* was isolated from the heart blood in all of them.

Vaccines.

Prophylactic vaccines were made for cholera and enteric group. The preparation of a cholera vaccine was undertaken in May. It was an unheated agar emulsion killed by one per cent phenol and in which four strains were used in the manufacture, three of which were local, and the fourth Indian. Fifteen thousand doses were issued, the bacillary content being 2,000 million per cubic centimetre.

In concluding this report we are desirous of expressing our thanks to Lieutenant-Colonel Woodside, R.A.M.C., our Commanding Officer, for the facilities which he has always placed at our disposal for carrying on the work. To the Medical Advisory Committee, and in particular to Lieutenant-Colonel Ledingham, R.A.M.C., and Lieutenant-Colonel Wenyon, R.A.M.C., we should like to acknowledge our gratitude for their very valuable advice and help during their stay in the country; to Lieutenant Baillie, R.A M.C., whose work in the laboratory during the most trying part of the hot weather was much appreciated, and to Assistant-Surgeon Ireland, I.S.M.D., and Corporal Muggleton, R.A.M.C., the latter for his work in connexion with plating and the collection of material in dysentery cases, the great part of which was done by him.

A TIME-GOVERNED SLIDE METHOD FOR THE AGGLUTINATION TEST ON A SERIES OF MICROBIC EMULSIONS.[1]

By Captain (local Major) W. BROUGHTON-ALCOCK.
Royal Army Medical Corps (S.R.).

This method for the rapid detection of agglutinins is one which permits of the simultaneous examination of several standard emulsions of micro-organisms and of the determination of results in three or four minutes. It was demonstrated and reported at the Military Hospital for Infectious Diseases in France and at the Pasteur Institute, Paris, in February, 1915, and later in London, and at the Army and Naval Central Laboratories in Italy. Extended details of the method, its application and results, were forwarded to Army Headquarters in May, 1916. Army bacteriologists have for some years (since 1906) used the method of placing drops of high titre sera diluted 1/100 on a microscope slide and making emulsions in such drops from cultures or colonies of bacteria to be tested; the results being observed by the naked eye. Similarly unknown sera have been tested in series on slides against known bacteria.

Many earlier workers also have used low dilutions of blood sera or of blood itself with one emulsion, and have used slides for observing the bacillary clumping, usually under the microscope. It has also been noted that agglutination is greatly facilitated by rotation of the slide on which the mixture of the serum and emulsion are placed; the contained organisms come into frequent contact with one another and the homogeneity of the serum dilution is maintained by movement.

The following is a simple practical macroscopic method whereby a measure of the agglutinin content of serum can be obtained and serial emulsions can be used—i.e., the serum can be tested against emulsions of a number of different organisms at the same time. By this method, as will be shown subsequently, the specific agglutinin can not only be detected, but can be distinguished from any co- or hetero-agglutinin, which may also be present in the serum, and possible errors of diagnosis by single emulsion examination can thus be avoided. As an example it may be here stated that I found, and by the absorption test confirmed, that a patient suffering from undulant fever may develop marked hetero-agglutinin action for *Vibrio choleræ*.

I have also endeavoured since 1912 to establish the principle that the agglutinin action can be measured by the time taken for agglutination to appear in fixed dilutions of serum.

The specific agglutinin in a given serum dilution acts more quickly

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[1] Note.—This paper was received for publication April, 1916, but was held over in response to a request from the author.

than the co- or hetero-agglutinin that may be associated with it, when the stock emulsions are employed.

Lieutenant-Colonel Harvey (Journal of the Royal Army Medical Corps, 1911) noted the more rapid action of the specific agglutinin in cases of infection with *Bacillus paratyphosus* A. In the *Lancet*, September 19, 1914, I reported some observations made when testing sera, after inoculations with some strains of *B. paratyphosus* B. They clearly showed, especially with regard to two of these strains, the earlier development in the serum and more rapid action of the specific agglutinin on the strain inoculated. It may be that this quality of a specific agglutinin can be utilized in the classification of types of micro-organisms of the same group.

When agglutination tests are to be carried out at intervals during the progress of a case and the results compared in time measurements, the serum requires to be so far diluted that agglutination will not be instantaneous in order that a measurement may be made of the time at which agglutination appears (i.e., thirty seconds or longer). An increase or decrease in the agglutinin content of a serum can be detected by the decrease or increase of the time taken for the agglutination of the emulsion in this dilution. Further, by testing on a slide drops of increasing dilutions of a serum with an emulsion the highest dilution that produces agglutination thereof in a specified time limit can be determined. The reading of results is made at the end of three or four minutes. Interval examinations are carried out on similar lines and the results are compared to detect any rise or fall of an agglutinin action.

The dilution of the serum employed for an initial agglutination examination, in the case of *B. typhosus*, *B. paratyphosi* A and B, *V. choleræ*, *Micrococcus melitensis* and *M. paramelitensis*, 1 in 10; in the case of *B. dysenteriæ* Shiga or Flexner-Hiss, 1 in 6. Agglutination appearing within three minutes determines a positive finding, after three and within four minutes a partially positive finding. Four minutes is the full time limit to be given to the test.

As the agglutinin content of sera developed during bacillary dysentery infection is small in comparison with that in enterica and melitensis infections, a lesser dilution than the 1 in 10 was found necessary to detect the specific agglutinin in many of these cases. Tests were made in which the dilution was 1 in 10 and the time extended to five minutes, but in bacteriologically proven cases most of which were due to *B. dysenteriæ* Shiga, seven per cent gave no agglutination throughout their illness when the cases were mild and were not treated at or early after onset by frequent salines, and fifteen per cent gave no agglutination when they were mild and were so treated. Frequent and comparative tests of varied dilutions showed that the 1 in 6 dilution of serum, and three or four minutes time limit given, as in testing agglutination of the other emulsions of the series in a 1 in 10 dilution, considerably increased the positive findings and gave more reliable results in bacillary dysentery cases.

During the carrying out of many comparative examinations by the established high titre methods at the temperature of the laboratory or at 37° C. or 55° C. and by the slide method, it was found that when a specific agglutinin action was determined by a high titre method a positive result was also detected by the slide method. Moreover, bacteriologically proven cases, especially those of bacillary dysentery when examined early, have shown a higher percentage of positive findings by the slide method; and there have been no inhibitory zones appearing with the dense emulsions employed.

Many strains of each group of micro-organisms that are being considered in this paper have been comparatively studied. The qualities sought in selecting a strain for the test are that it should not react to normal sera; secondly, that it should be as sensitive as possible to the specific agglutinins present in the sera of infected or inoculated persons; thirdly, that it should be as little as possible sensitive to the co- or hetero-agglutinins developed in the infections under study. Co-agglutinin and hetero-agglutinin action developed in sera during an infection cannot be avoided in all cases by the selection of any of the many strains I have worked with, but care in this selection and the shortening of time of observation has considerably reduced the number of sera that show these properties. The only micro-organism of those considered in this article which has developed hetero-agglutinin action in sera is the *M. melitensis*.

A point of great interest and value is that while employing the *dense* emulsions of practically medium-freed micro-organisms, I have been able to demonstrate by the method positive agglutination with sera in all dilutions tested when a zone of inhibition has appeared with a thin emulsion and the short or long methods employed. It may be that inhibition zones, which have been detected in the agglutination test, depend in some measure on the density of the emulsions employed; or, in other words, on the relation of the quantity of serum properties present to the quantity of micro-organisms on which these properties act.

In the Mediterranean Expeditionary Force one has constantly to be on the alert for the presence of any one or more of the several pathogenic micro-organisms. For example, the testing of serial emulsions has led to detecting a positive reaction to *V. cholerœ* in an alien from Serbia, not inoculated against cholera, who was admitted with a diagnosis of amœbic and flagellate dysentery, and to *M. melitensis* in one patient invalided from Mudros, suffering from amœbic liver abscess.

However, the agglutination test has not been diagnostic in every case, even when interval examinations have been made by either the slide or longer methods; but its value has been inestimable, and it has indicated in only the most exceptional cases misleading or constantly negative results. Considering that in the agglutination test there is but one constant factor, namely, the emulsion, and two inconstant factors—(1) The agglutinin response in the serum of the individual, and (2) the variation amongst

infecting strains of any one group—these rare difficulties in diagnosis by the agglutination test are comprehensible.

Professor Zammit and Dr. Rizzo Marich carried out some examinations on human blood sera and on goats' blood sera and milk for the agglutination of the *M. melitensis* by his own and by my methods, and obtained similar results. The blood sera of certain goats was in low dilutions positive for *V. choleræ* as well as for *M. melitensis* with which they were infected.

Observations have been made on more than 3,000 subjects. Bacteriological findings have given the necessary confirmation of the test in the majority of cases of infection. Some clinicians have shown its general utility in that they have been enabled thereby to test their patients' sera in their own side-rooms.

Preparation of Emulsions.—The morphology of the micro-organisms employed and their agglutinability should be watched and kept constant, and I have used for all subcultures a definite medium, which is ordinary nutrient agar with two per cent Witte's peptone titrated to plus ten acid to phenolphthalein. For the preparation of standard emulsions, subcultures of the stock growths preserved in an ice chest are grown at 37° C. for twenty-four hours (ninety-six hours for *M. melitensis* or *M. paramelitensis*) on similar agar. From the culture a platinum loopful is well emulsified in three cubic centimetres of Witte's peptone (two per cent) water, which is incubated for a few hours and then transferred to a Roux bottle containing the same agar medium for twenty-four hours (ninety-six hours for *M. melitensis* or *M. paramelitensis*). About ten cubic centimetres of 0·8 per cent sterile saline is then poured from a sterile pipette to wash off the culture. The growth plus saline from the Roux bottle is put into a tube and centrifuged in a high-power centrifuge till the micro-organisms are thrown down. The clear supernatant fluid is completely pipetted off and rejected. About ten cubic centimetres of formalized (2 per 1,000 commercial formaldehyde) 0·8 per cent sterile saline is added to the deposit by means of a sterile pipette to which is attached at the distal end a piece of rubber tubing and mouthpiece. By drawing the deposit up and blowing gently out many times an even emulsion is made. A loopful of the emulsion is stained and the morphology and purity of the micro-organisms examined. The emulsion is then placed in a very clean sterile test-tube and put into the ice chest. Sufficient time is given to allow any lumps to fall to the bottom of the tube, and the remainder is withdrawn and placed into a sterile flask with the quantity of formalized sterile saline that gives the required density. When an emulsion gives no growth on sowing, it is ready for its agglutinability to be tested. This test is carried out by means of the various high titre sera; the emulsions should show instantaneous agglutination in a dilution of 1 1,000 (titre of serum 1 8,000) in the case of the typhoid group, and in three minutes with emulsions of *M. melitensis* and the

dysentery bacilli. Both anti-sera Flexner and Hiss agglutinate the strain of Hiss employed. The other micro-organisms are only agglutinated by their respective anti-serum in the above test. When ready the emulsions are placed in rubber-corked phials two inches by $\frac{1}{4}$ inch for their preservation.

Standard Density.—The density was adopted as a standard after frequently trying various concentrations in saline of the micro-organisms with dilutions of their respective anti-sera in order to obtain that which best shows specific agglutinability within the time limit. Moreover, up to the present, with the emulsions in this density *I have not seen a zone of inhibition appearing when employing my method.* The varied sizes of the respective micro-organisms prevent standardization by counting unless a separate count is made for each. A suspension made by adding 6 cubic centimetres of a 1 per cent solution of $MgSO_4$ to a solution of 1 cubic centimetre of original lysol in 100 cubic centimetres of distilled water gives the same density when judged by translucency as does the standard emulsion of *B. typhosus*. The number of this bacilli per cubic centimetre is 27,000 millions. The other emulsions, save those of *M. melitensis* and *M. paramelite sis* which are prepared with a density three times that of the *B. typhosus* emulsion, are standardized by spreading them along with the *B. typhosus* emulsion in a broad stream on a clean slide, thus overcoming any difference in colour of certain micro-organisms when examined in tubes; judging with a lens the emulsion of unknown density is diluted so as to have the same opacity as the standardized typhoid emulsion.

In the cases of *M. melitensis* and *M. paramelitensis* the emulsions are standardized by diluting them until a loopful from a mixture of one drop of emulsion and two drops of normal saline corresponds in density to a loopful of the standard *B. typhosus* emulsion.

Technique.—One half of a cubic centimetre of blood is taken in a Wright's capillary tube and allowed to remain until the serum has separated from the clot. For the drops an ordinary Pasteur glass pipette has been found satisfactory. It is gauged to yield drops equal to one thirty-sixth of a cubic centimetre, i.e., half a minim when held perpendicular to the slide. The end of the pipette is drawn out so that the diameter of the terminal, $\frac{1}{4}$ to $\frac{3}{4}$ inch, is the same, so as to prevent the liquid running back the pipette before dropping. Graduated pipettes may be used. A rubber teat is attached to the other end of the pipette. In hospital routine work, I prepare three sedimentation tubes. Into the first is placed fifteen drops, into the second eight drops, and into the third and further tubes five drops of 0·8 per cent sterile formalized (2 per 1,000 commercial formaldehyde) saline. Three drops of serum free from blood corpuscles are placed in No. 1 tube, making with the 15 drops of saline already in it a 1 in 6 dilution. The contents of No. 1 tube are drawn up and blown gently back so as to mix them thoroughly, then 12 drops of this 1 in 6 dilution are placed in No. 2 tube to make a

1 in 10 dilution, the process of mixing is repeated, then 5 drops of No 2 is placed in No. 3 tube to make a 1 in 20 dilution. A piece of clear glass 8 by 1¼ inches, with spaces divided off by etched lines, gives sufficient space for the examination of several emulsions at the same time, and can be regularly wiped over with a cloth, and by flaming to dry between each examination. Microscopic slides can be used, but one has to employ extreme care when more than three emulsions are being tested thereon, in order to prevent the drops running together. From the first tube in which the dilution is 1 in 6, a drop is placed at the top of each of the first two spaces on the slide. From the tube No. 2 a drop is placed at the top of each of the five remaining spaces. To obtain drops of the same size, each falls slowly from the tip of the pipette held perpendicular to the slide and just above it. A handled thin platinum wire is used for transferring the emulsions on to the slide. The terminal of the wire is brought round in a circular loop two millimetres in diameter and continued for a short distance evenly underneath but away from the superimposed portion, so that the loop empties itself each time it is brought to touch the slide. The loop is flamed and, being thin, rapidly cools before use for an emulsion. Such a piece of platinum wire may be affixed to the cork in each phial of emulsion. Just under the drops is placed a loopful of the emulsion in the following order: *B. dysenteriæ* Shiga, *B. dysenteriæ* Hiss (the strain used for Flexner-Hiss group), *B. typhosus*, *B. paratyphosus* A, *B. paratyphosus* B, *M. melitensis* and *V. choleræ*. Other emulsions or the micro-organisms isolated are used as occasion may demand. When ready, the slide is lifted and turned so that the drops flow at the same time into the emulsions and down to the bottom of the slide, and the time is noted. As explained above, during the testing of a serum the slide must be frequently and gently half turned so that the drops may flow up and down. Half-minute readings are now made. The temperature of the slide during the test is kept at that of the laboratory during the tropical summer months, but in the cooler season it is kept at about 25° C. by passing it twice or thrice over the flame of a small spirit lamp. The addition of the emulsion I have considered practically negligible as regards the notation of the dilutions, since the emulsions are dense and there is slight evaporation, which is constant in all dilutions.

The systems of notation recording the results of time measurements are shown on next page.

If an emulsion of the *B. dysenteriæ* groups in the 1 in 6 serum dilution or an emulsion of *B. typhosus*, *B. paratyphosus* A or B, *M. melitensis* or *V. choloræ* in the 1 in 10 dilution shows agglutination by the formation of *definite flocculi* within 3 minutes, the reaction is considered positive; if only after 3 minutes and within 4 minutes, the reaction is considered partially positive to the micro-organisms contained therein. Some workers may need a low-power hand lens in the examination of results, especially to detect the early stage of agglutination of

M. melitensis. A black background screen is of advantage when the test is carried out in artificial light. Very rarely there develops in the drop of serum dilution and an emulsion, generally that of *B. dysenteriæ* Hiss, a finely granular appearance, which may be likened, for descriptive purposes, to that seen in a precipitin reaction. Absence of flocculi excludes such an observation from being classified as a positive agglutination finding in the test.

Agglutination positive, shown by a formation of definite flocculi	or	Result may be recorded as–
+ Instantaneous	or	8 +
+ 30 seconds	,,	7 +
+ 1 minute	,,	6 +
+ 1½ minutes	,,	5 +
+ 2 minutes	,,	4 +
+ 2½ minutes	,,	3 +
+ 3 minutes	,,	2 +
∓ 3 to 4 minutes	,,	± partial or ∓

No agglutination in 4 minutes

The dilution must of course also be noted.

Diagram ½ original

The test is extended only if indicated by the result of the initial examination. For example, (1) in the time measurement test when an emulsion is agglutinated immediately in the 1 in 6 or 1 in 10 serum dilution, an increased dilution that permits a measuring of the time necessary for agglutination to commence is sought, as thereby one may recognize in a similar dilution examined later any difference in the time necessary for the agglutination of the same emulsion to commence; or (2) when the end titre of the serum, as shown on the slide in three or four minutes, for the agglutinated emulsion is sought. Remaining drops of the 1 in 10 or the 1 in 20 dilution are ready for testing, and from the latter, if necessary, increased dilutions may be prepared.

When after the initial test drops of a series of dilutions have been prepared and employed in sequence on the slide for detecting the highest which agglutinates a loopful of an emulsion in three or four minutes, the result was reported by the usual system of titre notation with mention of the time required to show agglutination. Having had considerable experience of this and of the time measurement method detailed above, I find both are reliable, but the latter is more quickly done.

A platinum loopful of the emulsion for every 5 drops of serum dilution was put into each of a series of sedimentation tubes prepared by taking 5 drops of serum dilution from No. 3 tube into No. 4 tube containing 5

drops of saline, and so on from 4 to 5 and to the dilution desired, and the tubes after shaking them placed at 55° C. or at 37° C., or at the laboratory temperature, when a result from a longer method was required to compare it with any findings on the slide.

Modification of Technique for a Hot, Dry Climate.—In certain zones the temperature may be at or above 90° F., and the atmosphere be hot and dry, both day and night. Under such conditions, the evaporation is greater than in more temperate zones. I have, however, found most satisfactory results during two summers in the Mediterranean by giving a time limit of three minutes to the method and keeping in front of me a basin of water with bars across on which the slide can rest, and over which it can be manipulated. If one works slowly, it is more satisfactory to limit the number of emulsions to be tested at one time. Captain Garrow, R.A.M.C., one of the clinical staff to whom I demonstrated my method in his wards, subsequently devised a rocking chamber into which a slide is fitted when prepared for the test. His results have been published.[1]

In my experience, I have not found it necessary to depart from the simplicity of technique above described and much is learnt by watching the test throughout. As the climatic conditions in tropical countries remain for practical purposes constant over an extended period interval agglutination results may be made and compared.

Technique for an Immediate Agglutination Test.—A little blood of the patient is carefully drawn into the pipette and four drops thereof (which correspond to two of serum) let fall into a sedimentation tube or watch-glass. When clotting has taken place, ten equal sized drops of formalized saline are added. A dilution of the serum 1 in 6 is thus made. Six drops of this dilution are placed in another tube or glass and four drops of formalized saline added—thus a dilution of the serum 1 in 10 is made. Each dilution is tested for agglutinin contents as above described.

Since writing the above I have employed this test during an outbreak of plague with most satisfactory results. A 1 in 6 dilution of serum was used in the initial test.

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[1] Journal of the Royal Army Medical Corps, May, 1917.

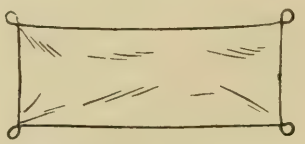
Clinical and other Notes.

THE CARRYING OF THE WOUNDED IN TRENCHES.

By Lieutenant B. GRAVES.
Royal Army Medical Corps.

The obvious and practically only way of meeting the difficulty if a man is to be carried effectually along the compact space, and around the narrow angles of an average fire trench—where one meets right-angled turns with every few yards—is to render him himself compact. This I mention anticipating the comment that a wounded man should not be doubled up; if that is to be adhered to, in a very large number of cases he must needs remain where he is! I am convinced that in the majority of cases there is no harm whatever to a wounded man being compressed by flexion of his legs, provided he is automatically held in a position of reasonable comfort, and without the necessity of himself making conscious efforts to maintain that position, and that in those few cases to which it may be detrimental the circumstances must be accepted as unavoidable.

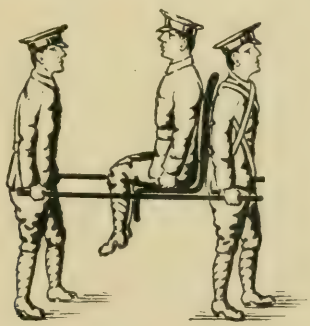
Almost as important is the question of the stretcher-bearer. It sounds so simple to talk of conveying a wounded man along the fire trench, and down the communication trench to the aid post "without delay"—let those that think so try it for themselves. From the point of view of pure physical exertion, the stretcher-bearer's is one of the most arduous of duties in an active period in the trenches. Struggling along under a very heavy load, trying to avoid different obstacles, frequently stumbling or slipping over the trench boards and uneven ground, and having at the same time to maintain his patient in a position of advantage—it does not require many such journeys to tire the strongest of men. Any small means contributing to lessen these difficulties are as important to the efficiency of the work of the stretcher-bearer as the many devices for the improvement of the pack have been to the comfort of the infantry man on the march.



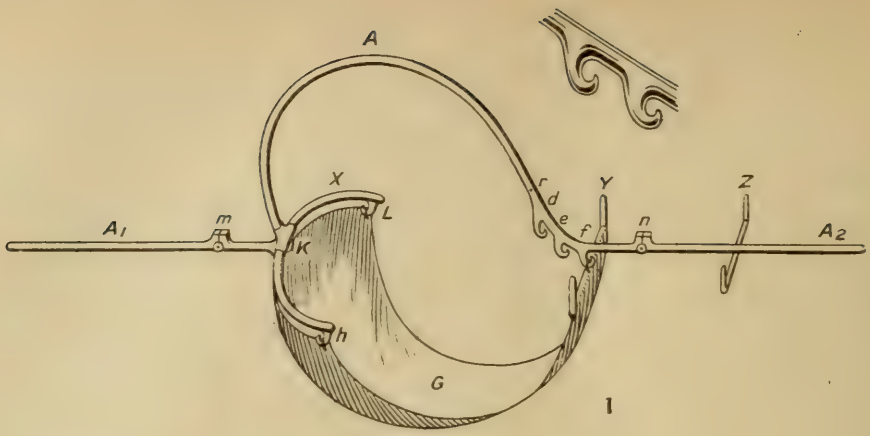
Bearing in mind the two main aspects—first the patients and then the stretcher-bearers—I have tried different means which have suggested themselves for meeting the difficulties. There are—though rarely—some parts in special trenches round which no conceivable form of stretcher or "carrier" could be manœuvred; such places are usually limited in extent, and for the short distance there may be no option but to drag the patient along the ground by his equipment. In such cases a rubber ground sheet is sometimes tried. As an improvement on this, a sheet of canvas of about the same size, provided with a rope ring at each of its corners, makes the task infinitely easier for the stretcher-bearer. These should not be difficult to make, say, to the number of one or two per company. One of my

stretcher-bearers made a good suggestion—that a sheet should be laid out on the stretcher before putting the patient on, so that on coming to corners which could not be negotiated with the stretcher the patient could with more ease be lifted off and carried round the narrow passage, to be again laid on the stretcher when the difficulty was past.

One of the most obvious ways of economizing space would be to carry the patient in a completely vertical position. It is not difficult to devise an arrangement borne on the shoulders of the two stretcher-bearers from which the patient is suspended at full vertical length, but any such arrangement is undesirable for the reason that, for his feet to clear the ground, his head must be at a high level involving undue exposure to fire. A similar objection applies to the method already tried of carrying the patient in a hammock slung from a pole on the shoulders of the bearers. There is, moreover, another objection to this means of carrying: when the weight to be borne is higher, and has its points of application directly on the shoulders of the bearers, it is necessary for the bearers to exercise considerably greater effort to recover balance from their frequent tendencies to stumble over the ends of trench boards, than when the total weight lies at a lower level. Further, to ease the weight on the shoulders from time to time, the bearer has to exercise an upward *pushing* effort with his arms involving a greater muscular effort than the upward *pull* of handles which are suspended low down in a sling from the shoulder. These disadvantages are to some extent overcome by a pattern of trench-stretcher recently adopted, but unfortunately the objections, in other directions, far more than outweigh any advantageous features that may be claimed for it; some of these will be evident from the accompanying sketch.

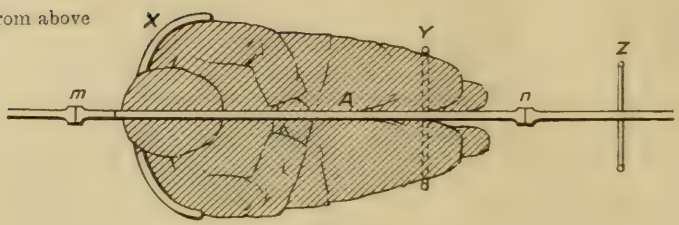


Firstly, to mount the patient on the stretcher requires the assistance of one if not two extra men, and the patient has to be subjected to some considerable manipulation before this is finished. The patient is in such a position that he has always himself to exert a certain amount of conscious effort to maintain it, and, in many cases, if a man is well enough to do this he may be well enough to crawl or walk. It is true that this design is of shorter length than the old pattern of stretcher, but it still possesses the objection of having two handles, widely separated, projecting at each end—always an objection when negotiating narrow corners As the bearers walk along, practically all the weight is borne by the front bearer, and worse, owing to the fact that the upward continuation of the canvas which forms the seat is securely fixed by cross-straps to the front bearer,



1

View from above



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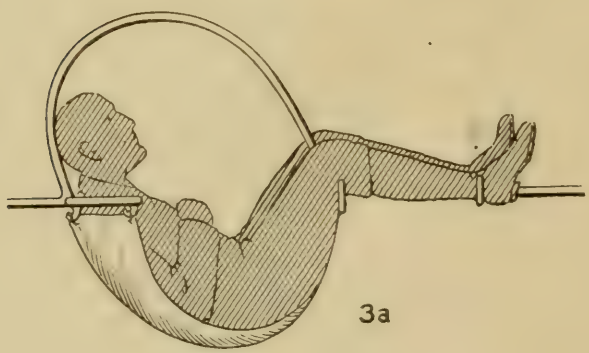
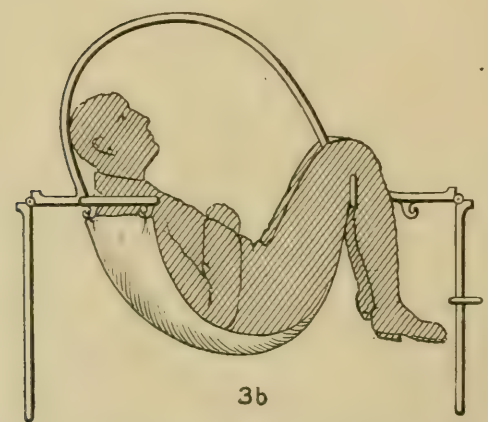


3a



3b

Drop ends *A1* and *A2* when bearers are going round sharp corners, or when they wish to rest the weight on the ground.

it is impossible when they pause to temporarily rest the weight on the ground. For a similar reason, each bearer cannot alternately take the heavier end by an exchange of places. So great are these objections that I find my stretcher-bearers loth to use these, and they always prefer to leave them behind when going into the trenches!

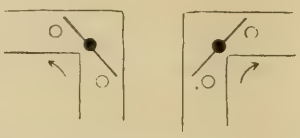
With a view to overcoming such objections, and also of gaining further advantages, I have suggested a design for a trench carrier, which seems to me satisfactory. In the accompanying illustrations, fig. 1 represents the appliance complete; fig. 4 its two component parts. *A* is a single steel tube (bicycle tubing), the straight extremities of which (*A1* and *A2*) are so jointed that they can drop through a quarter of a circle to the vertical position. A curved horizontal crossbar, *X*, is brazed to this tube at the point *C*; this is provided with three strong hooks, *H*, *K*, *L*, one at each extremity and one in the centre; there are three similar hooks, *d*, *e*, *f*, at a suitable distance apart on the other end of the curved portion of *A*. A short crossbar with upturned ends is fixed to the extremity *A2* at a suitable distance, to be explained below. A canvas sling, *G*, has, at one end, three rings (best fixed to a piece of thin rope sewn into the end of the canvas for strength) at distances corresponding to the hooks *H*, *K*, *L*. Into the other end of this canvas is sewn a length of steel tubing with upturned ends and having a single central ring, *p*, capable of being suspended to any one of the three hooks, *d*, *e*, *f*.

Figs. 5 (*a* and *b*) and 6 (*a* and *b*) illustrate the means of mounting the patient in this carrier *without the necessity of first lifting him from the ground*. The sling is spread at length under him by folding the canvas up against the bar *Y*, placing the whole under the knees, and then straightening out the canvas beneath him; it is somewhat similar to the device for placing a bed-sheet beneath a helpless patient. The steel tube frame is then lowered over, and the three rings on the hinder end of the canvas attached to the hooks *H*, *K*, *L*; the ring *p* is attached *between the patient's knees* to any one of the hooks, *d*, *e*, *f*—according to the length of the patient, and also whether it is desired to carry him as in fig. 3*a* or, when space is very confined, in the attitude of fig. 3*b*.

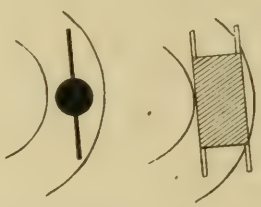
The bearer has a simple sling hanging from one shoulder down to the opposite side (fig. 9*a*, compare with 9*b*) to rather below the level of the hip.

The bearers proceed as in fig. 8*a*; on coming to a corner or when wishing to *pause for a rest*, they drop the extremities *A1* and *A2*, and hold by the short length which remains; should they pause these extremities *serve as legs* to rest the weight on the ground. At many of the less acute corners it is only necessary to lower one of these ends; or there may be circumstances when it is easier to get round by alternately lowering first one and then the other end. The objection may be raised that owing to the patient not being in a direct line with the bearers, but slightly to one side, the whole arrangement forms a sort of triangle with the patient and two bearers respectively disposed at the three angles, and consequent increase in width. Not only is this readily obviated by disposing the bearers on opposite sides of the handles so that the patient comes in the central line (fig. 8*a*) but it is in reality an advantage. As an example, supposing the bearers are progressing as in fig. 8*a*, the front man to the right of the handle, the rear man to the left, and they come to a right-angled turn going say to the left, it is only necessary for the

front man to change sides (fig. 7*a*) to gain considerable advantage from this disposition when going round the corner, for the whole group then approximates to a *curve* having its convexity to the right. Correspondingly, to pass round a corner to the right it would be necessary for the rear man only of fig. 8*a* to change his side.



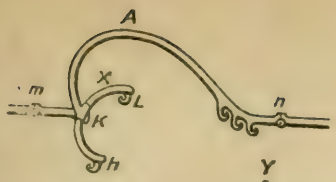
In regard to the question of width, this carrier is at no point wider than the patient—indeed, the patient's body forms the maximum width, a condition which cannot obtain in a stretcher, and this point of maximum width is approximately limited to the *centre* of the whole arrangement—a fact of considerable importance



Comparison with ordinary rectangular stretcher.

for negotiating *curves*. One attempt to carry a double-handled stretcher around corners and curves in trenches is sufficient to demonstrate the difficulties caused by making the stretcher in the form of a rectangle. (*See* diagram.)

It may be said that it is too heavy a load to be borne in one hand by the bearer; but the cross-sling relieves this, and it is not impossible to use both hands. Moreover there are salient points in this arrangement; firstly, the stretcher-bearer is free to use one hand for steadying himself against the side wall of the trench—this is of considerable importance over muddy or irregular ground, and saves much wasted effort on the part of the bearer. Secondly, the disposition of the carrier is not affected by suddenly removing one hand, as it may be when two laterally disposed handles are provided. Incidentally it is a matter of comfort to the patient to appreciate that the carrier does not twist laterally to unsafe angles with the risk of his falling out, as when lying on a plane surface held by two handles at each end. It has been suggested that the patient would swing laterally with each movement of the bearers; this is not so, for his centre of gravity is not far below the horizontal level of the handles, as a result of which there is little or no tendency for this to take place—experiments with an improvised wooden model have borne this out. Both for this reason and also owing to the design of the curve in the bar *X* there is little or no tendency for the patient to fall out laterally. Although he can be readily mounted or dismounted, once in he is secure; the canvas, conforming to the curve of the bar *X* for some distance down its length, embraces the patient who tends, by his own weight, to



5a

5b

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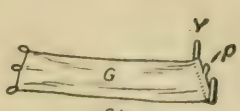
6a



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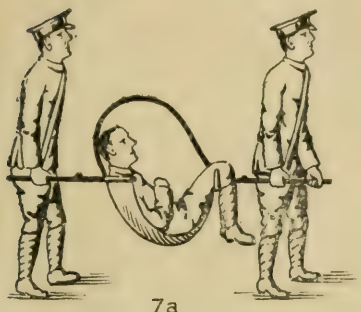
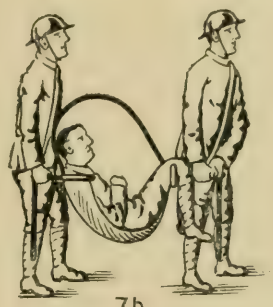


7a



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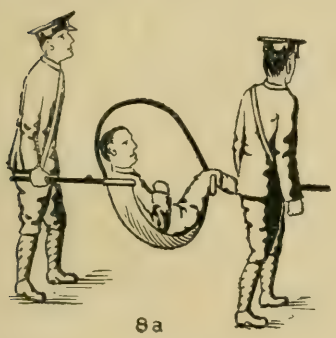

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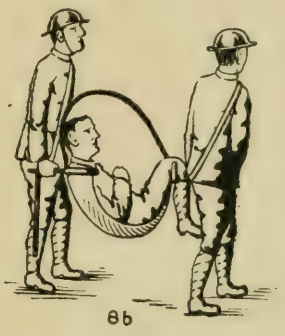

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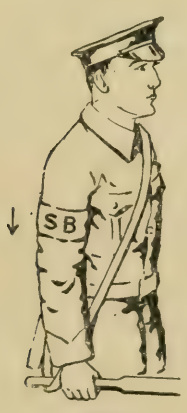


9a

9b

Direct downward pull in lateral line with the centre of gravity of the body and bearing from the shoulder.

Compare: Pull downwards and *forwards* from the *back of the neck* by the sling of an ordinary stretcher, causing considerable fatigue and wasted effort.

automically fall back into the hollow so formed. It might be said that unequal pressure on one side of the bar *Y* might tend to its tilting, and one leg or the other slipping off; but in the first place there is no reason to anticipate unequal pressure, and, as I have found in practice, the bar *Y* cannot rock in the vertical plane owing to the fact that each end is equally pulled upon by the edge of the canvas being kept *taut* with the patient's own body-weight.

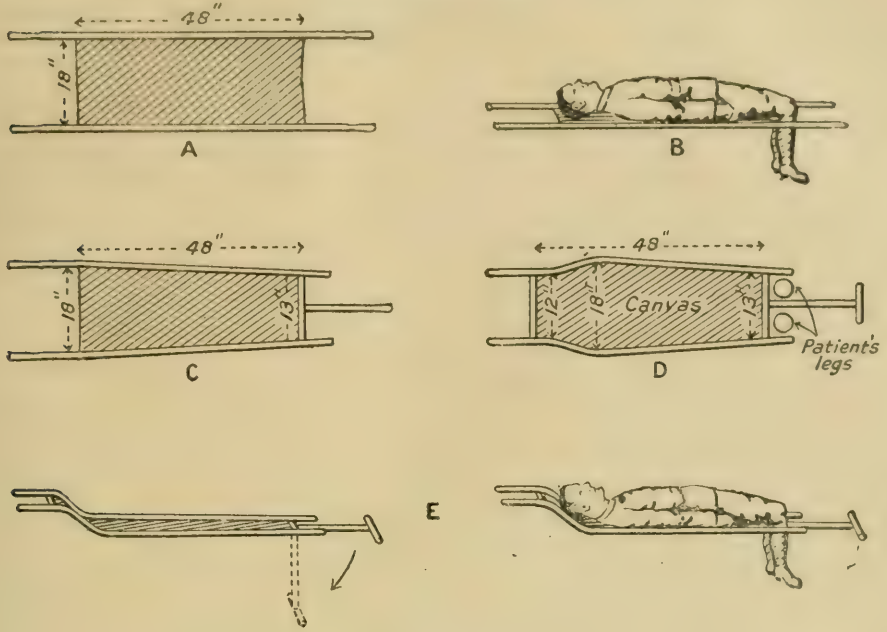
The purpose of the bar *Z* is obvious from figures 3*a* and 3*b*. I have not shown in the drawing a small addition which is desirable, namely, a small curved head-rest to each extremity of which a short length of webbing is attached to fasten round the head when a patient is unconscious. It will be found in practice that this need only be quite small. It is a good addition to have a small rope ring permanently fixed to each corner of the canvas—it facilitates mounting and dismounting the patient.

There are certain points from a structural point of view which it is necessary to mention. The first is the question of strength and where to apply it. At first sight one might think that the curved part of the bar *A* must be so strong as to be clumsy; this is not so. The line of the canvas completes an approximate circle, and when the handles are lifted by the bearers the only force operating on the curve *A* is one tending to compression throughout the line of this curve; any tendency to bending open of the curve is counteracted in the binding together of the ends of the arc by the tension of the canvas. On this account the bar *A* can be of relatively light tubing. The points actually needing strength are at the commencement of the straight ends, close to the points of attachment of the canvas. There is nothing against having a taut steel wire stretching on each side from the extremities of the bar *X* to a point, say *r* on the bar *A*; it would not interfere with the patient, but I do not consider it necessary. The approximate distance between the extremities of the arc *A* should be about two feet, and the length of the canvas must be such that the centre of gravity of the patient will fall below the horizontal level of the handles.

I think that this carrier altogether overcomes the disadvantages of the appliances mentioned above, in that it is light, of a medium width and length; the patient, though secure, is easily detached and is self-supported; the direction of the force is *directly downwards* and the weight is equally shared by the bearers who, besides having one hand free, can pause to rest the weight on "legs" at will. It should be simple to use by a stretcher-bearer once it is explained to him; it is after all nothing like so complicated as many of the contrivances we see nowadays in the trenches. A stretcher-bearer should surely be able to manipulate a carrier of this sort.

There remains only the question of the attitude of the patient from a medical aspect. One may occasionally come upon some unsuitable case, but not often. The compression of the abdomen by the thighs may be an advantage in "shock," comparable to the effect of bandaging the abdomen; and the elevation of the legs to bandaging of the limbs. In a case of fractured thigh it is not impossible, by putting a pad beneath the leg over the bar *Y*, to create extension by the patient's own body-weight. Flexion which is unavoidable in the trenches is by no means uncomfortable provided that the patient is *secure* and is so held without making any exertion of his own. I think the common idea that a wounded man must necessarily lie at full length to get the best advantage originates perhaps from the

Suggested modifications of an ordinary stretcher for cases in which it is essential that the patient should be flat.

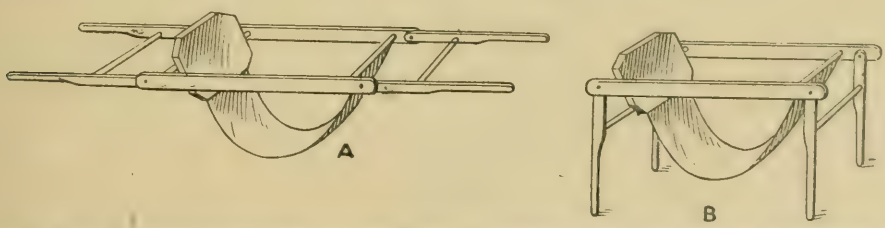


E, front extension hinged so that it may be dropped to vertical.

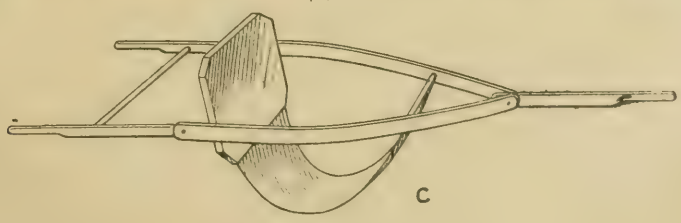
A, ordinary stretcher, shortened and reduced in width (dimensions of canvas = 48 inches by 18 inches), the patient's legs hanging down over end, B.

C, modification of A, making one end narrower (13 inches), and having a single central handle for front bearer.

D, improvement on C, frame for canvas made of light steel tubing, the head end also being reduced in width (12 inches). Lest there should be any tendency for the stretcher to rotate and turn over owing to lessening of the distance separating the two handles of the head end, these handles are so bent as to be slightly raised above the level as shown in side view, E.



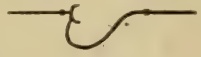
To drop ends, stretcher-bearers spread knees to support handles, transfer grip of hands to ends of side-struts, and then remove support of knees from under handles, allowing the latter to drop down.



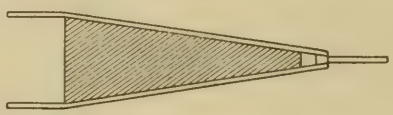
Improved pattern of above.

fact that we have not been accustomed to see wounded men carried in any other way. In using this carrier, I would have the ordinary stretcher kept by the bearers in a dug-out at the last point of constriction along the communication trench beyond which it is known there is freedom for the passage of these.

The carrier I have described would be taken about on the march by inverting it and laying it on the ordinary stretcher, with the curved part dropped down between the bars.



I may add that an improved pattern of the ordinary stretcher for use in communication trenches could be made by diminishing the width of one end, and substituting the two handles at that end by a single central one; with this it would be necessary



to tie a bandage or puttee around the patient's feet. This alteration would materially assist negotiation of curves.

There is yet another possible modification of the ordinary stretcher which might be very convenient in communication trenches with sharp turns, though it is not sufficiently modified to be of use in the average fire trench (see Diagram and Notes on p. 439). I also illustrate a suggestion for a device for getting patients in from No Man's Land without the necessity of the stretcher-bearers standing upright, viz., a jointed toboggan on three rollers drawn by a short length of rope.

Simple toboggan, in two parts, jointed together, the whole on three rollers, made in plain wood. For getting patient in from No Man's Land, stretcher-bearers crawling.

The accompanying illustrations (A, B and C on p. 439) show another model I have made and used (thanks to the assistance of a Royal Engineer officer) somewhat in imitation of the steel tube carrier, but it is not a good substitute, though being made of wood, it is not difficult to build. Though short it has wide extremities liable to catch on sharp corners; the whole thing is necessarily rather wider than the maximum width of the patient; and mounting a patient is not a simple matter as is the case with the other pattern. This design, however, as a compromise has its uses, and I intend trying one with a slight improvement, namely, to cut down the width of the front end as suggested above for an ordinary stretcher, and substitute a single hinged central handle projecting in front.

I may say that an arrangement on wheels would appear to me altogether impracticable for use over trench boards, as ordinarily seen.

In conclusion, if this steel carrier does possess certain disadvantages for some few selected cases or if a few corners can be found round which it could not

be carried, I would add that whilst no one device suggested by experiment can be capable of meeting every contingency, neither is any one likely to be destitute of value if it sufficiently reconciles a large number of obvious difficulties; this pattern seems to cover these more than any other I have tried.

AN INVESTIGATION INTO THE RESULTS FROM TREATMENT OF BACILLARY DYSENTERIES BY SERUM AND BY SALINES RESPECTIVELY.

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Late Medical Officer and Registrar, Imtarfa Military Hospital, Malta.

Dysentery of a bacillary type has been extremely prevalent amongst our troops in the Salonica area, and has resulted in the invaliding to England of a number of men. The following investigation was therefore undertaken in order to ascertain, if possible, the relative efficiency of the two more important methods of treatment at present in use. From the large amount of material to which I had access it was finally decided to select only those cases which occurred during 1916, and in which the diagnosis of dysentery had been confirmed by bacteriological examination. Such a limitation has necessarily resulted in the inclusion of an unduly large proportion of exceptionally severe and complicated types of the disease, since a laboratory examination for all was an impossibility and was naturally reserved for the more acute cases or for those presenting special features. It was found that in 535 cases a dysentery bacillus had been isolated. These have been divided into two groups which are dealt with separately, viz., cases due to an infection by the bacillus of Shiga, and those due to an infection by either the bacillus of Flexner or the bacillus of Hiss (Y). Those showing mixed infections, e.g., by the bacillus of Shiga + *Bacillus typhosus*, have been excluded throughout.

The methods of treatment under consideration are the two now most commonly adopted, namely, treatment by anti-dysenteric serum either alone or in combination with salines, and treatment by salines only. As will be shown later, the dosage both of serum and of salines as administered to these cases was extremely varied.

Shiga Dysentery.

The bacillus of Shiga was isolated in 395 cases, eleven of which terminated fatally. Eighteen cases which recovered and six fatal cases were instances of double infections and are therefore excluded from the following figures. A further eighteen are also excluded as they received neither serum nor salines during the course of their illness. It is, however, interesting to note that several of these latter who received practically no treatment became chronic carriers of the bacillus of Shiga.

Of the remaining 348, anti-dysenteric serum was given to 176, whilst 172 received salines only. As affording some guide as to the efficacy of treatment the cases have been classified according to their mode of progress towards convalescence, and in order to render the results more strictly comparable the day

of illness on which treatment was commenced has always been taken into consideration.

Class I.—*Convalescence rapid.* A total of 157 cases received treatment *on or before the fifth day of illness.* Of these, sixty-four per cent who were given serum made a rapid recovery, as compared with forty-eight per cent who received saline treatment only. Of cases coming under treatment *between the sixth and tenth days of illness* twenty-six per cent of those who received serum, even at this late stage, could still be shown to have made a rapid convalescence as compared with only fourteen per cent who received salines. Even *after the tenth day of illness* it is still possible to obtain five per cent of rapid recoveries, when serum is administered, though not a single case treated with salines at this stage could be placed in this class.

Class II.—Convalescence slow, but generally quite satisfactory. The slow rate of progress of cases in this group was often accounted for by an intercurrent attack of malaria. The majority were able to be transferred finally to a convalescent camp, though a small number of severe cases which were treated with serum were sent to England for the completion of their cure. The figures of cases in this class are shown in Tables I and II, and not much is gained by a further study of them.

Class III.—Convalescence Unsatisfactory. By this is meant a failure to respond to treatment or the development of some complication. This group is one of considerable interest. Of 157 patients treated *on or before the fifth day of illness*, in only nine per cent of those who received serum could convalescence be said to have been unsatisfactory, as compared with twenty-five per cent of those who received salines only. Of cases coming under treatment *between the sixth and the tenth day of illness* as many as twenty-seven per cent of those who received serum fall into this class, a fact which serves to emphasize the necessity for *early* treatment with serum. High as these figures are they are even higher for those who received saline treatment only, where it was found that in fifty-eight per cent convalescence was unsatisfactory. The majority of cases in this class had of necessity to be invalided to England, some showing every indication that their disease was passing on into one of chronic dysentery. The appended tables set forth the actual figures on which the above percentages are based.

TABLE I.—Shiga Dysentery, treated with Anti-dysenteric Serum.

Treatment begun on	Number of cases	Convalescence		
		Rapid	Slow	Unsatisfactory
1st day of disease	--	—	—	—
2nd ,, ,,	9	8	1	—
3rd ,, ,,	10	7	3	—
4th ,, ,,	26	16	7	3
5th ,,	19	10	6	3
6th ,, ,,	26	8	13	5
7th ,, ,,	22	6	9	7
8th ,, ,,	9	2	4	3
9th ,, ,,	4	1	2	1
10th ,, ,,	12	2	6	4
After 10th day	39	2	19	18

TABLE II.—Shiga Dysentery, treated with Salines only.

Treatment begun on	Number of cases	Convalescence: Rapid	Convalescence: Slow	Convalescence: Unsatisfactory
1st day of disease	2	2	—	—
2nd ,, ,,	12	8	3	1
3rd ,, ,,	30	14	10	6
4th ,, ,,	29	13	6	10
5th ,, ,,	20	8	6	6
6th ,, ,,	16	5	3	8
7th ,, ,,	20	3	7	10
8th ,, ,,	9	—	4	5
9th ,, ,,	6	—	4	2
10th ,, ,,	5	—	2	3
After 10th day	23	—	6	17

It should be noted that not a single case with an unsatisfactory convalescence occurred amongst those treated with serum on or before the third day of illness, though such was not the case with those who received salines only. Moreover, after the seventh day of illness no single case treated with salines made a rapid recovery, whereas, even at this late stage, a small number who received serum thereafter made rapid progress.

Relapses.—It was noticed that there were several instances where patients, who appeared to have responded satisfactorily to treatment, suddenly developed a return of acute dysenteric symptoms whilst still in hospital. These have been termed relapses. All occurred within forty-five days of the original attack, and when finally invalided home several showed evidence of the condition becoming one of chronic dysentery. Of sixty-four patients who received serum *on or before the fifth day of illness* three per cent relapsed, whilst of ninety-three saline-treated cases, fifteen per cent relapsed. In those coming under treatment from *the sixth to the tenth day of illness* relapses occurred in 4 per cent who received serum, and in 19·6 per cent treated with salines only. Whilst of cases not treated until *after the tenth day* relapses occurred in five per cent of those who received serum and in 21·7 per cent of those who received salines only.

TABLE III.—Showing Percentage of Serum-treated and Saline-treated Cases which become Carriers.

Treatment commenced	Carriers: Serum	Carriers: Salines
On or before 5th day of illness	1·5 per cent.	10·7 per cent.
On or before 10th day of illness	2·7 ,,	7·0 ,,
After 10th day of illness	10·0 ,,	21·7 ,,

Carriers.—Any case in which it has been possible to isolate dysenteric organisms eight weeks or more after the onset of illness has been classed as a carrier. Only a small number of examinations were made at this late stage of the disease, so that these figures are necessarily incomplete. As already mentioned several instances of carriers occurred amongst men whose original attack of dysentery had been so mild that a restricted diet and a single dose of an aperient relieved them of all symptoms for the time, but as these had received neither salines nor serum, they are not included in the following figures. Of cases treated *on or before the fifth day* of illness only one who received serum is known to have become a carrier as compared with ten who were treated with salines

only, a percentage of 1·5 and 10·7 respectively. The value of serum in the *prevention* of these carriers is best shown in the accompanying table (Table III), and again it will be seen that to obtain the best results serum should be administered early in the disease. Trial was made of serum for the *treatment* of these carrier-cases but without any benefit.

Arthritis. — When examining the records of several thousand cases of dysentery, arthritis as a complication was found to occur in only a very small percentage. The majority developing this complication were, however, bacteriologically examined and hence an unduly high percentage is shown in the present series of bacteriologically proven cases. It is interesting to note that arthritis was often found associated with conjunctivitis or with iritis. In two instances patients with arthritis were found to be Shiga carriers. In 137 cases treated with serum *on or before the tenth day of illness* no single instance of arthritis occurred, whilst of thirty-nine cases which did not receive serum until after the tenth day arthritis occurred in one. Trial was made of serum for the *treatment* of this complication, but without any apparent benefit, and nearly all cases had finally to be invalided home.

Cardiac Complications.—These comprise chiefly cases of cardiac dilatation, though there are included also a few instances of persistent tachycardia where no record has been made as to the condition of the heart. Of 157 patients treated *on or before the fifth day of illness* cardiac complications occurred in six per cent of those who received serum, and in fourteen per cent of those who received salines only. For cases treated *after the tenth day* cardiac complications occurred in 15·4 per cent of those who received serum and in nine per cent of those receiving salines. The smaller percentage amongst these saline-treated cases which came under treatment late in the disease can be readily accounted for by the milder, less toxic type of disease which these patients exhibited.

TABLE IV.—Shiga Dysentery. Complications and Sequelæ in Serum and in Saline-treated Cases.

Day of illness on which treatment commenced	Number of cases		Relapsed		Carriers		Arthritis		Cardiac complications	
	Serum	Salines	Serum	Salines	Serum	Salines	Serum	Salines	Serum	Salines
			Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
On or before 5th day	64	93	3	15	1·5	10·7	—	5·3	6	14
On or before 10th day	73	56	4	19·6	2·7	7	—	5·3	16·4	16
After 10th day..	39	23	5	21·7	10	21	5	4·3	15·4	9

Deaths.—There were five fatal cases and death was found on post-mortem examinations to be due to *B. dysenteriæ Shiga* infection, and only one received serum before the tenth day of illness. This was an acute case admitted very toxic on the second day and treated at first with salines only. On the seventh day he became slightly jaundiced. On the seventh, eighth and ninth days serum in twenty cubic centimetres doses was administered subcutaneously. On the tenth day the stools are noted as much improved in character, but on the thirteenth day the patient suddenly collapsed and died. Three fatal cases were instances of dysentery complicated by the occurrence of malarial attacks during

the acute stage. No serum was given until the fourteenth, thirty-fourth and fifty-sixth days of illness respectively, and death occurred on the fifteenth, forty-second, and sixty-eighth days respectively. The remaining case was treated with salines from the fifth to the eleventh day, when twenty cubic centimetres of serum were administered. Diarrhœa still continued. On the thirty-fifth day he began to pass much bright blood, which continued for six days. Emaciation became extreme. On the one hundred and fourteenth day symptoms pointing to perforation set in and death occurred four days later.

Flexner-Hiss Dysentery.

Cases of dysentery due to an infection by the bacillus of Flexner or by the "Y" bacillus have been grouped together, there being only 140, and clinically they much resembled each other. With but three exceptions the cases were of a milder type than those due to an infection by the bacillus of Shiga, and there were no deaths. Ten patients had double infections, and are therefore excluded from the following figures, together with a further twenty-eight who received neither serum nor salines during the course of their illness.

Serum-treated Cases. — Only thirty-five cases of Flexner-Hiss dysentery received any serum treatment. Of eighteen treated *before the fifth day of illness* convalescence was rapid and satisfactory in fourteen. One became chronic and developed persistent tachycardia, two others developed cardiac dilatation and one relapsed and was known to be a carrier of the Flexner bacillus fourteen weeks after the onset of illness. Of seventeen cases treated *after the fifth day* convalescence was rapid and satisfactory in ten. Four showed signs of the condition becoming chronic and were invalided home, whilst three others developed cardiac dilatation. A point worth noting is the fact that cases with an infection by the "Y" bacillus did not respond to serum treatment as satisfactorily as did cases with an infection by the Flexner bacillus.

Saline-treated Cases.—Sixty-seven patients were treated with salines only. Of these forty-four received treatment *on or before the fifth day of illness*, and twenty-three made a rapid recovery. Convalescence was unsatisfactory in nine cases, four of whom had bad relapses. Cardiac complications occurred in five, and one case was known to have become a carrier. Of twenty-three patients treated *after the fifth day of illness* only six made a rapid recovery. Convalescence was unsatisfactory in eight, all of whom had finally to be invalided home. There were five cases which relapsed, five which developed cardiac complications, and three who were known to have become carriers.

In this group of Flexner-Hiss infections there was only one case of arthritis, and it is doubtful whether even this one could be classed as a true dysenteric arthritis, as the patient had for many years been subject to attacks of "rheumatism" associated with swelling of various joints. Whether arthritis ever occurs as a complication in dysentery of this group is a point requiring more accurate observation. There was, indeed, one other case of arthritis not included in the present series as no pathogenic micro-organisms could be isolated from the stools. His blood-serum, however, agglutinated the bacillus of Flexner sufficiently strongly to indicate that his dysentery had been due to infection by that organism. Neither of the above recorded cases of arthritis was associated with iritis or with conjunctivitis.

A summary of the results following treatment of Flexner-Hiss dysenteries is appended in Table V.

TABLE V.—Comparing Results from Treatment by Serum and by Salines respectively in Flexner-Hiss Infections.

Method of treatment	Convalescence unsatisfactory	Carriers	Relapsed	Cardiac complications
Serum before 10th day ..	7 per cent ..	3 per cent ..	3 per cent ..	17 per cent
Salines before 10th day ..	22 ,, ..	6 ,, ..	14 ,, ..	15 ,,

Methods of treatment as exemplified in the present series of cases. In the treatment of these bacteriologically diagnosed dysenteries there is exhibited a marked degree of variation as to dosage and the frequency of administration of the doses both of serum and of salines.

Anti-dysenteric Serum.—The serum used was in the majority of cases a polyvalent one. A few cases of Shiga dysentery in garrison troops were treated by Dr. B. M. Cunningham with Shiga anti-dysenteric serum (Pasteur Institute) supplied through the kindness of Major W. Broughton-Alcock. Serum was at times given alone following a single dose of some aperient medicine, at other times in combination with salines administered more or less frequently. The smallest single dose was ten cubic centimetres—this patient (Flexner dysentery) received such a dose on the sixth and eighth days of his illness with but little benefit, followed by twenty cubic centimetres on the tenth day. Convalescence was slow, the man not being fit for convalescent camp until the end of the fourteenth week.

Another case received ten cubic centimetres on the tenth, eleventh and thirteenth days of illness; he developed severe serum sickness on the twenty-third day, followed by persistent tachycardia, but was transferred to the "Heart Clinic" of a convalescent camp at the end of fourteen weeks.

Several severe toxic cases received 100 cubic centimetres or more at one dose; one such case coming under treatment on the fourth day of illness was given 115 cubic centimetres of serum on the fifth day and 120 cubic centimetres on the sixth day. Convalescence was rapid, and the patient was transferred to camp at the end of eight weeks. The largest total amount of serum given to any one patient was 420 cubic centimetres. Treatment was not commenced until the seventh day; from then onwards to the twentieth this man received doses varying from 100 cubic centimetres to 20 cubic centimetres. He was transferred to camp at the end of eleven weeks. Another patient received between the sixth and thirteenth days a total of 340 cubic centimetres of serum together with intravenous salines and drachm doses of sodium sulphate by the mouth. He went to camp at the end of eight weeks. It is interesting to note that in both these cases serum sickness was mild.

From a study of the case-sheets of patients treated by serum it would appear that the best results are obtained where serum has been given in fairly large doses (forty to sixty cubic centimetres of polyvalent serum) and on consecutive days, salines being administered simultaneously by the mouth. The following examples serve to illustrate this point and its converse.

Salines.—The statement "case treated with salines only" in practice meant varying dosage and intervals, and largely depended on the severity of the case. Some medical officers would prescribe sodium (or magnesium) sulphate in drachm

or half drachm doses every hour for six, twelve or even twenty-four doses; others every two hours for twenty-four hours followed by less frequent doses. Other cases would receive these doses only every four hours and occasionally a mild case would be ordered salines only three times daily.

TABLE VI.—Serum Treatment, with Fairly Large Doses given on Consecutive Days.

Case No.	Treatment commenced	Days on which serum given	Daily dose of serum	Result	
			Centimetres		
7	6th day of illness	6th, 7th and 8th	60, 40, 40 ..	Convalescence rapid and uneventful	To camp in 8 weeks
11	4th ,, ,,	4th, 5th, 6th and 7th	60, 40, 40, 40	,, ,,	To duty in 9 weeks
25	7th ,, ,,	7th and 8th ..	60, 60 ..	,, ,,	To camp in 7 weeks
104	2nd ,, ,,	2nd and 3rd ..	60, 60 ..	,, ,,	To camp in 6 weeks
112	4th ,, ,,	5th, 6th and 7th	60, 60, 60 ..	,, ,,	To camp in 6 weeks

TABLE VII.—Serum Treatment, showing either too Small Dosage or Intervals between Doses too long.

Case No.	Treatment commenced	Days on which serum given	Daily dose of serum	Result
			Centimetres	
9	5th day of illness	12th and 14th..	40 and 20 ..	Slow progress. Invalided home
21	2nd ,, ,,	5th, 6th, 7th, 9th and 11th	20 each dose	Slow progress. Cardiac dilatation. Invalided home
57	7th ,, ,,	8th and 11th ..	60, 60 ..	Unsatisfactory result. Invalided home
431	2nd ,, ,,	3rd and 6th ..	50, 40 ..	Slow progress. Invalided home
86	4th ,, ,,	4th, 6th and 11th	20, 20, 40 ..	Unsatisfactory progress. Invalided home
301	3rd ,, ,,	5th, 6th and 11th	20 each dose	Became chronic. Invalided home

Summary.—It would be very difficult to obtain a parallel series of cases of equal severity and treated uniformly, on the one hand with serum combined with salines and on the other hand with salines only. Such an achievement could alone give strictly comparable results. Had it been possible to have included in this report every case of dysentery which passed through the hospital the results as obtained from *all* cases treated with serum would have still been by far and away the best, though at the same time the results from *all* cases treated with salines would have been better than in the present series of cases.

In spite of the severe type of case which was treated with serum the results have been shown to be vastly superior to those from cases which received salines only. All the figures, however, bring out the importance of early serum treatment. It should be noticed that no fatal case occurred amongst patients treated before the end of the first week. Even in Shiga dysentery eighty-eight per cent of cases treated from the second day and seventy per cent of those treated from the third day of illness made a rapid recovery, nor was there from amongst these cases a single one which had to be invalided home or which did not finally make a complete recovery. Even of those treated on or before the fifth day there were

only ninety per cent whose convalescence could in any way have been termed unsatisfactory.

Moreover, as a preventive of certain complications and sequelæ, serum holds a most important position. For example, it has been shown that not a single case of dysenteric arthritis occurred among patients who were treated on or before the fifth day of illness, and though data are necessarily incomplete, carrier cases would appear to be of far less frequent occurrence when serum has been used. Further, in spite of the toxic condition of so many of the patients when they first came under observation, only six per cent of those treated on or before the fifth day developed cardiac dilatation or persistent tachycardia. Not only was convalescence rapid when serum was given early, and repeated in adequate doses, but relapses were very rare, so that a more rapid evacuation of patients to convalescent camp was possible than in the case of those treated with salines only. The average duration of hospital treatment for the two classes of cases was found to be 8·6 and 9·6 weeks respectively.

It is therefore urged that there should be :—

(1) A more extensive use of anti-dysenteric serum which should be *given at the earliest opportunity*.

(2) *That doses should be adequate*, by that I mean at least 40 cubic centimetres of polyvalent serum, for a case of moderate severity.

(3) That two, three, or even four such doses should be given *on consecutive days*.

(4) That *at the same time salines by the mouth* should be administered frequently, drachm or half drachm doses every hour or every two hours until the stools become fæcal, and thereafter in gradually diminishing doses.

In conclusion I desire to tender my thanks to Lieutenant-Colonel G. B. Price, Officer Commanding Imtarfa Military Hospital, and to Major W. Broughton-Alcock, officer in charge of laboratory, Imtarfa Military Hospital, for facilities given to me for my work and for much encouragement and kindly advice.

Reviews.

THE CAUSATION OF SEX IN MAN. By E. Rumley Dawson, L.R.C.P.Lond., M.R.C.S. London: H. K. Lewis and Co., Ltd. Second Edition. 1917. Pp. 226. Price 7s. 6d. net.

In the second edition of his interesting monograph, Mr. Rumley Dawson has strengthened the evidence in support of his contention that the sex of an unborn child may not only be foretold but also even predetermined. The author's aim is to prove that unilateral ovulation occurs bimensually, and that the ovum proceeding from the right ovary is invariably endowed with male potentiality. Evidence in support of this theory is quoted from the results of operations and post-mortem examinations on cases of extra-uterine pregnancies and also by examples showing the interdependence of the succession of sexes and month of birth in large families. A careful scrutiny of the facts brought forward by the author leads one to the conclusion that his theory is worthy of serious consideration by all medical men,

and by gynæcologists in particular. The book is written in an interesting style, and is easily comprehensible by intelligent readers outside the medical profession.

W. J. D.

THE PRACTITIONER'S POCKET PHARMACOLOGY AND FORMULARY. By L. Freyberger, J.P., M.D. London: William Heinemann. 1917. Pp. 545. Price 12s. 6d. net.

The object of this volume is to provide medical men with a handy epitome of the essential facts concerning the drugs in the British and United States pharmacopœias, and in addition to supply information on the more useful non-official drugs. There is no doubt that success has been obtained, for the book describes briefly the characters, mode of dispensing, pharmacology, therapeutics, dosage, and toxicology of practically every drug on which information is likely to be sought by practitioners. Particulars are also given of many trade preparations which, through advertisement, have become familiar by name at least to the medical profession; the dilutions of drugs required to prepare lotions, etc., are stated, and formulæ have been included to illustrate the methods of prescribing many of the drugs; these features should prove useful for reference purposes. A more critical selection, however, of the diseases mentioned under the heading "Indications" would, in our opinion, have improved the book, thus those referred to as amenable to treatment by conium furnish one case in point.

The volume is arranged on strictly alphabetical lines, and concludes advantageously with an index of the drugs grouped according to their therapeutic uses. The book, which is published in a form convenient for the pocket, can be warmly recommended to practitioners as a concise and handy dictionary of information on modern remedies.

W. J. D.

THE AFTER-EFFECTS OF WOUNDS OF THE BONES AND JOINTS. By Aug. Broca, Professor of Topographical Anatomy to the Faculty of Paris. Edited by R. C. Elmslie, M.S., F.R.C.S., Major, R.A.M.C. (T.), Orthopædic Surgeon to St. Bartholomew's Hospital. [Military Medical Manuals, University of London Press.]

A work upon this subject is greatly wanted. The military hospitals of all countries are full of men with persistent sinuses and stiff joints, and these conditions, although, of course, quite well known, had become comparatively so rare before the War owing to a prolonged period of antiseptic surgery that they possess for many surgeons features of novelty. The result, in Professor Broca's words, is that "the older surgeons have renewed their experience of, the younger have seen for the first time, these interminable effects of a diffuse traumatic osteomyelitis." The picture that he draws in the opening paragraphs of Chapter III of the conditions prevailing in the hospitals in France with regard to the treatment of these chronic bone sinuses is a natural outcome of this comparative novelty of chronic septic osteomyelitis, and it doubtless applies to all the contending armies. Therefore we are prepared to welcome a book that aims at presenting a well-proportioned account of these refractory sequelæ and their treatment.

The only criticism that we are inclined to make upon the work as a whole is that the author tends to look upon his subject as an established and unavoidable condition, the main interest of which is the treatment. It would seem better to take the view that the primary point of interest in this lamentably frequent condition is whether or not it is possible to prevent its occurrence by treatment applied in the earliest stages of the case. Upon this aspect of the case Professor Broca does not touch; a matter for regret, since there must be a strong feeling in the minds of some of those who have been able to follow gunshot fractures throughout their course that it ought to be possible by appropriate measures to prevent much, if

not all, of this subsequent disability. The primary factor is, of course, sepsis, and there is no doubt that the injurious influence that this has exerted upon fractures in the past is greatly diminished owing to the improved methods of early wound treatment now in vogue. The only other really important factor is the presence in the callus of sequestra due to the death of more or less adherent splinters. It would have been interesting to have Professor Broca's views upon the possibility of eliminating these adverse factors, for without doubt this lies at the root of the whole matter. If by early and radical treatment a fracture can be put into such a condition that sequestra will not form, the occurrence of chronic septic osteomyelitis would be practically at an end, and gunshot wounds of bones—and to a great extent of joints also—would lose nearly all their gravity both from the surgical and the economic point of view. In this connexion it is interesting to note the views of another distinguished French surgeon, Professor Leriche, who deals very lucidly and forcibly with this subject in his two volumes upon Fractures in the same series.[1] The question is one that might profitably form the subject of a special research. In the hands of an able surgeon provided with facilities for early operation and prolonged observation, it should yield one of the most valuable pieces of work in war surgery. Running through the whole of chronic septic osteomyelitis is found the condition which was always a bugbear to operating surgeons before the War, but which has now assumed very serious proportions indeed, viz., the septic cavity in the bone. Any method that offers the surgeon a reasonable prospect of avoiding the occurrence of such a cavity would be a very valuable advance in treatment.

Professor Broca's book hardly calls for detailed criticism. As Major Elmslie says in his Introduction to the English Edition, "the methods of treatment advised are such as cannot be disputed by any surgeon who is experienced in the treatment of diseases of the bones." For us the chief merit of the book is the emphasis it lays upon the necessity for dealing with these cases as if they were really serious and not mere trivial matters to be left to the unskilled or the untrained. Any surgeon who reads it will never be likely to regard the sequelæ of injuries to bones and joints too lightly: they will appear to him in their true light as a group of the most crippling and baffling cases with which he can be called upon to deal.

The sections upon treatment are broad-minded and sound, and the insistence that treatment should be based upon accurate knowledge of the actual conditions present and should be rigidly purposeful is very much to the point. The description of the steps of the typical operation upon a bone sinus is most excellent: the greatest stress is laid upon the radical treatment of sinuses leading down to cavities in bone, and this is one of the most valuable parts of the book; it should finally dispose of the view that these sinuses can be adequately dealt with by means of a sharp spoon. The truth is that a radical and often an extensive and severe operation is required, and this must be based upon accurate localization, and extremely searching and painstaking in its performance. It is to be noted as a point of interest that the author never employs a tourniquet in these operations. His reasons for this are not clearly stated, which is to be regretted, since his practice is opposed to that of many surgeons.

Another point of general interest and importance that is strongly emphasized in this book is that stiff joints should be kept at rest until all articular osteitis has subsided. The same point has been strongly urged by Professor Leriche in his book on Fractures involving Joints, and a disregard of this advice has led to many disastrous results in the earlier days of the War at the hands of those who, judging by the conditions in the pre-war period, saw in an ankylosed joint an

[1] "The Treatment of Fractures." By R. Leriche, Assistant Professor in the Faculty of Lyons. (Military Medical Manuals.)

articulation that required for its satisfactory treatment frequent forcible movement. That the exact reverse is the truth is clearly pointed out in the book before us. A further point, which is in striking contrast to the views of the majority of surgeons in the pre-war period is the value of gradual mobilization of a stiff joint as opposed to sudden and complete restoration of its movements by force. On this point Professor Broca gives valuable advice, drawn from his extensive experience. The ground is well covered, and most of the known methods are dealt with.

The subject of the influence of malunited fractures upon the action of neighbouring joints receives separate consideration from the point of view of the normal and pathological mechanics of the bones and joints. This subject is very inadequately dealt with in ordinary works on surgery, and the reader will find in this part of the book much to interest and instruct him. From it he will learn the mechanical disabilities that may follow malunion of a fracture and the principles underlying their successful treatment, namely, the discovery of the actual mechanical cause and its correction if possible by osteotomy, instead of wasting time and effort upon massage and mechano-therapy which can be of no possible service.

The book concludes with some medico-legal considerations arising out of the cases under notice. These are, of course, primarily directed to the conditions in the French Army, but they have a distinct bearing upon those in our own country and well repay perusal.

It is an excellent book, by a well-known authority, full of sound teaching and well up to date. It is well translated and easy to read. F. F. B.

Emergency Surgery. By John W. Sluss. Fourth Edition. Illustrated. London: William Heinemann. 1917. Pp. xix and 848; $7\frac{3}{4} \times 5$.

An excellent and practical book which should be in the library of every student and practitioner; it is full of interest and information. Only one objection can be urged against it, and that is that there are more printing errors than should be found in a fourth edition, but this does not detract from the marked merit of the work.

Heath's Minor Surgery and Bandaging. London: J. and A. Churchill. 1917. Pp. x and 476; $7\frac{1}{4} \times 4\frac{3}{4}$.

Heath's "Minor Surgery and Bandaging," edited by Mr. Morriston Davies, has now reached its sixteenth edition (after being first published in 1861). The book is written particularly for the use of dressers, house surgeons and junior practitioners, and it may be confidently recommended to their notice. This last edition contains a new chapter on gunshot wounds, but since modern war surgery moves so rapidly, this will probably soon need revision.

Review of Tropical Diseases: A Manual of the Diseases of Warm Climates. By Sir Patrick Manson, G.C.M.G., M.D., LL.D., etc. London: Cassell and Co., Ltd. 1917. Pp. xxii + 968.

First published in 1898, Sir Patrick Manson's Manual of Tropical Diseases has exhausted five distinct editions besides several reprints—evidence indeed of its popularity and of its having successfully fulfilled its original purpose, viz., the provision of a handy sized volume for practitioners in the Tropics.

A sixth edition is now published bringing the subject matter fully into line with present-day knowledge.

The manual as the outcome of a long lifetime's experience in the clinical, laboratory and teaching aspects of tropical diseases, is full of useful information and stimulating indications for future research.

Only a very carping criticism could direct attention to minor errors and omissions, more especially as the work deals with a varied series of diseases which of late years have received much attention from investigators in widely separated parts of the world. Under such conditions it must be an extremely difficult matter for an author to decide upon what to eliminate and what to retain. The author himself has already pointed out two such omissions in his letter of December 11, viz., the omission of Dr. Water's work on epidemic bronchial spirochætosis in India, and the omission of Drs. Dutton and Todd's work in connexion with the development of the spirochæte of tick fever in the *Ornithodorus moubata*.

It is significant that the author concludes his chapter upon the malarial parasite with a suggestion that, complex as it is already, the story of the parasite may not yet be complete; he directs attention to the possibility of yet another intra-corporeal phase, perhaps some encysted form capable of lying latent and under certain conditions waking to activity and so bringing about relapses; also to the possibility of some other extra-corporeal form by which infection may be conveyed from the mosquito to its larvæ, or some phase which may carry on the species through other warm-blooded hosts than man.

The original classification of malignant parasites is still adhered to, viz.:—

(1) Subtertian.
(2) Quotidian.
    (*a*) Pigmented.
    (*b*) Not pigmented.

Basing his opinion upon clinical manifestations, the author is inclined to believe that even this classification may not complete the list.

He does not touch upon the results obtained from artificial cultures by observers later than Bass except to mention that Bass's observations have been confirmed by others; the important observation of the clumping tendencies displayed by malignant parasites in artificial cultures as these parasites near maturity is not referred to. This omission is all the more unfortunate as the tendency to clumping would appear to afford a very reasonable explanation of the almost complete absence of parasites from the peripheral circulation for some hours previous to the rigor or *accès* of temperature in many cases of malignant infections.

The exact rôle of quinine in the treatment of malaria, he admits, is as yet very imperfectly understood. Can it for instance accomplish anything more than the temporary arrest of schizogony? Some authors would have us believe that something like a sterilization magna is possible and apparently with that end in view advise quinine to be given much more freely than Sir Patrick recommends in his routine treatment.

In three sentences the author points out that quinine is not wholly effective against the parasites, that quinine is a double-edged tool capable of doing harm as well as good and that other factors, vital vigour and physiological rest, play important parts in warding off relapses.

Quinine favours latency, nowhere does he suggest it being a permanent cure. Until we know what and where the latent phase is we cannot learn directly the effect of quinine upon it, but, on the other hand, experience affords abundant evidence that cases of malaria relapse or do not relapse after intensive quinine treatments, after milder quinine treatments, after tonic treatments and after no treatment at all. At the present time, the important point to determine is how much of the debility, especially cardiac debility, seen amongst malaria-stricken soldiers is due to malarial degeneration, how much to excessive physiological strain and how much to the effects of intensive quinine dosage. In other words, can intensive treatment bring about a greater evil than the condition it is given to relieve? This is a problem of immediate and national urgency and one deeply

regrets that the author with all the weight of his experience has not dealt with it at greater length. But from the tenor of his writings one, I think, could infer that he would not be in favour of intensive quinine courses.

Regarding the mode of administering quinine he gives precedence to the oral route, next in order to the intramuscular, thirdly to the rectal and lastly to the intravenous route, and apparently he would reserve the intravenous injection for special cases. This is a view that possibly many will question, judging from the trend of recent literature—Bacelli and Wright's methods for intravenous administration are both quoted but no remarks are made upon their relative values, a point of considerable importance to practitioners in the Tropics, whose conveniences for giving an intravenous injection are often far from being all that could be desired unless the technique is made as simple as possible. Bacelli's method, 10 cubic centimetres of a 10 per cent solution, or 5 cubic centimetres of a 20 per cent solution injected slowly, as recently recommended and reported upon in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, both fulfil the condition of simplicity, whereas Wright's method of giving the dose in 250 to 300 cubic centimetres is practically impossible without elaborate conveniences.

Blackwater fever, for so long regarded as a phenomenon of malarial fever, has in this edition, as in some previous editions, a chapter to itself, and the author suggests that it may possibly be due to an infection of the Babesia group and that quinine and malaria merely act as secondary agents—depressors of vitality—in precipitating an attack. He advises quinine to be given during an attack if the attack is associated with malaria parasites in the circulating blood.

Now that the malarial diagnosis is usually made on dried and stained films (which are in practice so much more convenient than wet films of fresh blood), a coloured plate of all phases of the parasite as seen in films stained by one or other of the Romanowsky modifications would be a useful and I think a very much appreciated addition to future editions; also a coloured plate of leucocytes similarly stained.

Amongst the imperfectly differentiated fevers the part played by bacilli of the colo-typhoid group is perhaps under-estimated. The chart of double continued fever of Hong-Kong which has appeared in all editions reminds one very much of typhoid or paratyphoid with a relapse, or as occurring in China it reminds one perhaps still more forcibly of the initial fever met with in cases of *Schistosomum japonicum* infection. A differential leucocyte count in such a fever in China would have been most valuable: the giant urticarial eruptions are only present in a minority of such cases—their presence is a valuable guide but their absence means nothing. The advice however to treat all doubtful fevers as if they were cases of typhoid is advice which all practitioners, more especially those new to the Tropics and the bugbear of uncertain fevers, should take to heart.

The chapters upon plague, leishmaniasis, trypanosomiasis, leprosy, yaws, yellow fever and dengue are remarkably complete and seem to exhaust everything there is to be said about them. Reference is made to Plimmer and Thompson's successful employment of antimony tartarate injections into rats infected with the non-pathogenic *Trypanosomum lewisi*, whereas the successful results were obtained by Plimmer and Thomson and upon rats infected with the highly pathogenic strains of *T. evansii* and *T. brucei* (see *Proceedings of the Royal Society*, B, vol. 80).

Pellagra and beri-beri are very fully gone into and the theories of their causation very fairly discussed. Together with epidemic dropsy they make up a section all by themselves entitled "General Diseases of Undetermined Nature." Rat-bite diseases which used to occupy the place of pellagra in this section are now classed amongst the fevers.

The usual diagrammatic representation of the cysts of entamœbæ, flagellates

and ciliates conveys rather a poor conception of these cysts as they are really seen; here again a coloured plate would be invaluable representing these cysts all under the same degree of magnification and stained by a commonly used clinical stain such as iodine.

To anyone who has successfully employed Cox's continuous intravenous normal saline transfusion, or, what is still better, this transfusion preceded by Roger's hypertonic transfusion, both given slowly through Cox's very ingenious apparatus, in cases of cholera, there will be regret that such a valuable means of combating this terrible disease receives so little notice.

Para-cholera is not referred to, yet bacteriologists frequently find Koch's vibrio absent in cases of what clinically resemble cholera both in type and severity; other organisms have been found in such cases and variously designated. It seems likely that in future our standard literature will have to recognize para-cholera just as it has already recognized paratyphoid.

The most outstanding new feature of scientific interest in the section of animal parasites is the recent work by Leiper upon the development of schistosomes through the intermediary of certain species of freshwater snails. An excellent help to diagnosis is the addition of photomicrographs of several intestinal ova; most of the more common ova are so illustrated, but so excellent and useful are they that one wishes the series had been made more extensive.

There is a useful appendix upon protozoa and in the body of the book useful guiding tables for the identification of species of mosquitoes and other insects, but the work lacks a chapter upon poisonous snakes and insects, and the more common food and plant poisons met with in tropical climates.

The field covered is an extensive one, yet every chapter may be considered to be a complete monograph of its subject. Clinicians, investigators and teachers will all alike find practical help and advice of the best kind. One wishes there were more medical works like it, handy sized volumes containing everything that really matters in all aspects of their subjects. J. A. T.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

April, 1918.

War Office,
March 7, 1918.

With reference to the awards conferred as announced in the *London Gazette*, dated October 18, 1917, the following are the statements of service for which the decorations were conferred :—

AWARDED A BAR TO THE MILITARY CROSS.

Temp. Capt. Oswald John Day, M.C., M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in leading his bearers through enemy barrages. He organized stretcher-bearers and effected the recovery of many wounded from close to the enemy's lines. (M.C. gazetted June 18, 1917.)

Temp. Capt. Archibald Fullerton, M.C., M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in dressing and evacuating thirty cases of another division and over fifty of his own battalion under most adverse conditions. His medical orderly was killed, leaving him single-handed, and one shell killed and wounded twelve of his stretcher-bearers. (M.C. gazetted January 1, 1917.)

Temp. Capt. Noel John Hay Gavin, M.C., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked unceasingly for many hours at night dressing the wounded. When the Medical Officer sent to assist him was killed and the aid post was wrecked by shell fire, he continued his work of tending the wounded in the trenches and the open until relieved, although slightly wounded. He carried out his duties regardless of personal danger. (M.C. gazetted June 4, 1917.)

Temp. Capt. Arthur John Rushton O'Brien, M.C., M.B., African Medical Service.

For conspicuous gallantry and devotion to duty in action. He repeatedly dressed the wounded under heavy artillery and machine-gun fire in the open, bringing out about 150 wounded with stretcher parties, until he himself was dangerously wounded whilst performing his duties close to the firing line. (M.C. gazetted February 13, 1917.)

Temp. Capt. David James Sheiress Stephen, M.C., M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty in making a most daring reconnaissance in search of an aid post. Under very heavy fire he made arrangements for the removal of the wounded and bringing up medical supplies. On another occasion he took over the evacuation of the wounded and reorganized the system of evacuation, displaying cool judgment and contempt of danger in searching for the wounded. He set a fine example to his men. (M.C. gazetted July 24, 1915.)

AWARDED THE MILITARY CROSS.

Capt. John Alston, Royal Army Medical Corps, Special Reserve.

For conspicuous gallantry and devotion to duty when in charge of stretcher-bearers. He worked unceasingly for fifty-four hours, during the whole of which time he was under heavy shell fire, evacuating the wounded and clearing the field with great rapidity and skill. He declined to be relieved until he had seen the work through, setting a splendid example of cheerfulness and courage to all who were working with him.

Capt. Robert Ringrove Gelston Atkins, M.B., Royal Army Medical Corps, Special Reserve.

For conspicuous gallantry and devotion to duty. For seventy-two hours he worked continuously with his stretcher squads under very heavy artillery fire. He worked throughout a whole night between the various regimental aid posts and the advanced dressing station, organizing the evacuation of a large number of stretcher cases. He set a splendid example to all under him.

Temp. Capt. Phillippe Bernard Belanger, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He moved about in the open, often having to jump from shell-hole to shell-hole, tending the wounded, regardless of the continuous machine-gun and shell fire. He was entirely responsible for the bringing in of many wounded men and thereby saving their lives. He did not desist until he had the whole battalion sector cleared of wounded, and throughout he set a magnificent example to the stretcher-bearers who followed him.

Capt. William Somerset Birch, Royal Army Medical Corps, Special Reserve.

For conspicuous gallantry and devotion to duty. For seventy-two hours he worked with the stretcher-bearers of his field ambulance and collected the wounded under continuous fire. By his cheerfulness and disregard of danger he set a splendid example to all his bearers.

Temp. Capt. Archibald Grainger Bisset, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. During heavy shelling of his battalion, when it was impossible to establish a dressing station, he went up and down the line himself attending to the men as they fell. Whenever a shell burst in the vicinity he at once hastened to the spot and did not leave the shelled area after his battalion had moved off until every case had been evacuated. He has shown the greatest gallantry and coolness at all times, notably on one occasion when, although badly gassed and unable to stand, he continued to attend to the wounded until he collapsed.

Capt. Arthur Bloom, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. Several casualties were caused by shell fire at a battery position. He at once went 300 yards through a heavy barrage to the position, being blown up by an exploding shell on the way. He immediately attended to two wounded men, and then, while the battery was still being shelled, went round the position and attended to other wounded men. He displayed great courage, and his prompt action was one of very great value.

Temp. Capt. Oswald Vincent Burrows, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. For forty hours he worked unceasingly succouring the wounded, about 300 of whom passed through his hands during that period.

Temp. Capt. Charles Kingsley Carroll, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He carried on his work during an attack in one of the most exposed situations regardless of his own safety. His energy and devotion to duty saved many lives.

Temp. Capt. John Percival Charles, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked untiringly evacuating the wounded during the attack, continually dressing the wounded in shell-holes under very heavy fire until he was wounded. He set a magnificent example of fearlessness and devotion to duty.

Temp. Capt. Andrew Tocher Cunningham, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during a raid on the enemy's lines. He worked continually throughout an intense bombardment, attending to the wounded at the aid post until they had all been attended to and evacuated. He showed great courage and devotion to duty.

Temp. Capt. Lionel Montrose Dawson, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. While acting as officer in charge of bearers, he searched and cleared the line during the advance and during a counter-attack. He kept the regimental aid posts clear under trying circumstances, frequently going through a hostile barrage. He remained at his post for twenty-four hours without rest under very heavy fire.

Temp. Capt. Harold John de Brent, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He went about in a most fearless manner under heavy shell and machine-gun fire, collecting the wounded, dressing them in the open, and cheering them up. He remained in the most advanced position, almost surrounded by the enemy, until he had succeeded in attending to and clearing all the wounded. He took on the work of two other medical officers who were wounded, and remained at his post for a further five days. His conduct was magnificent throughout.

Temp. Capt. Carl Keating Graeme Dick, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He rescued three men from a dug-out which had been blown in and brought them to his aid post. His aid post was under shell fire,

but he went on working; and when his aid post was full he continued work outside utterly regardless of his own safety. It was largely owing to his gallant conduct that so many wounded were safely evacuated.

Temp. Capt. James Dickson, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty at his aid post when a shell exploded in the doorway, killing and wounding fourteen persons in the room where he was. Although very badly shaken, he continued his work until relieved twenty-four hours later.

Lieut. Louis du Vergè, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an action. He constantly dressed the wounded in the open under heavy shell fire, and showed complete disregard for his own safety.

Temp. Capt. Henry Hawes Elliot, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during several days' operations. He was out under very heavy fire finding wounded men, attending to them, and helping them back to the aid post, and, though wounded, continued at duty. When his aid post received several direct hits, he succeeded in evacuating all the wounded to a safer position. He set a fine example to his stretcher-bearers.

Temp. Capt. Henry Vincent Forster, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during several days' operations. When a counter-attack seemed imminent, he rallied every available bearer under heavy fire and evacuated all the wounded through a heavy barrage. He set a magnificent example to all.

Temp. Capt. Cosmo William Fowler, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked throughout the day during an attack, showing complete disregard of danger. On two occasions he went out in front of the line and brought in wounded who would otherwise have fallen into the hands of the enemy.

Temp. Capt. James Harcourt Cecil Gatchell, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked with great zeal for many hours in the open under heavy shell fire. He frequently dressed wounded men on the spot where they were hit, and when he was wounded he refused to leave his post until ordered to do so by his commanding officer. His contempt of danger and devotion to duty were an example to all ranks.

Temp. Lieut. John Alan Campbell Greene, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. When an advance dressing station was shelled with 8-inch shells, he at once went to the spot and began to dig out men who were buried. Though the shelling continued, he did not desist until satisfied that the men were dead. He then assisted in clearing the entrance to the dressing station and attended to the wounded within. He showed an entire disregard of personal safety in his efforts to save life.

Capt. David Alexander Ross Haddon, M.B., Royal Army Medical Corps (Territorial Force).

For conspicuous gallantry and devotion to duty. The dressing station was very heavily shelled, and he immediately ran to the centre of it, where he attended to all the wounded, and assisted in the evacuation of stretcher cases. He carried out operations in a hut which was continually under shell fire. He set a magnificent example to all.

Capt. John Livingston Hamilton, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty when in command of a stretcher-bearer sub-division during a raid on the enemy's lines. During an intense bombardment, and when he himself was twice wounded, he continued to dress the wounded throughout the night until they had all been evacuated. He set a magnificent example throughout the action.

Temp. Capt. David Cochrane Hanson, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. Regardless of all danger, he attended to the wounded in the open under the heaviest shell fire, and, though knocked over several times by the explosion of shells, he continued to direct the work, and succeeded in getting the wounded out of the barrage zone. His gallant conduct was undoubtedly the means of saving many lives.

Temp. Capt. Arthur Randell Jackson, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He was ceaseless in his efforts to get in casualties, repeatedly going forward through enemy barrages to the advanced posts. He worked in the open throughout the day, and set a splendid example to his stretcher-bearers.

Capt. Charles Llewellyn Lander, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked at an advanced dressing station on the line of the enemy barrage, and afterwards passed through the barrage to another dressing station, where he worked for a day and a half under continuous shell fire. He showed great courage and disregard of danger.

Capt. Harold Dunmore Lane, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. During a daylight raid on the enemy's trenches he established his aid post in front-line trench, and worked there for many hours under

heavy artillery fire. He attended to the seriously wounded cases in the open, and was instrumental in bringing in all the wounded from No Man's Land and getting them successfully away.

Capt. Peter MacCallum, M.B., Royal Army Medical Corps, Special Reserve.
For conspicuous gallantry and devotion to duty. He was in charge of the evacuation of the wounded from an advanced position, and worked in the open under very heavy fire for four successive days and nights, organizing stretcher squads and directing the removal of the wounded. He was the means of finding several severely wounded men lying in shell-holes and bringing them to safety under heavy fire. His splendid example and utter disregard of danger were largely responsible for the success of the evacuation.

Temp. Capt. Donald John Macdougall, M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. During the seventy hours the battalion was in the line he displayed great courage and fearlessness, dealing with a large number of wounded without assistance when all his orderlies had become casualties and his stores had been destroyed by shell fire.

Capt. Albert Edward Peel McConnell, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty when in charge of the evacuation of the wounded. Though heavily shelled he kept his line perfectly clear. He superintended the evacuation personally, working for forty-five hours without ceasing under the most difficult and dangerous conditions, and by his example encouraged the men under him in every possible way. Later, he took two stretcher squads to the relief of batteries which were being heavily shelled

Temp. Capt. Douglas Charles Murray Page, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty in going through a heavy barrage in search of two wounded officers, about 500 yards across the open. He dressed their wounds in the open by the light of the gun flashes. Hearing that the Medical Officer of the relieving unit had been wounded, he obtained permission to remain with the incoming unit.

Capt. William Barry Postlethwaite, M.B., Royal Army Medical Corps, Special Reserve.
For conspicuous gallantry and devotion to duty. He set a splendid example of untiring energy and contempt of danger to his stretcher-bearers throughout the operations, repeatedly leaving his aid post under heavy fire to attend to the wounded. He organized bearer-parties and went forward with them into No Man's Land and brought in a large number of wounded.

Capt. James Wilfrid George Hewat Riddel, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. While the battalion was assembling for the attack he attended to a large number of wounded on the spot. He was shelled out of his aid post, but during the whole of the day of the attack he attended to the wounded under heavy fire, and at night, when all the cases at the aid post had been attended to, he went out and dressed cases in No Man's Land, and guided stretcher parties to the wounded lying out in front.

Temp. Capt. William Russell, M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. When his Regimental Aid Post was blown in and most of the personnel and wounded killed, he went up to it through a heavy barrage and succeeded in evacuating all the survivors. On six occasions during the day he guided parties of bearers and brought back wounded, always in the open under heavy fire.

Capt. James Bethune Scott, M.B., Royal Army Medical Corps, Special Reserve.
For conspicuous gallantry and devotion to duty. A camp was heavily shelled and many casualties were caused. He showed great gallantry in going to the assistance of the wounded on three separate occasions in spite of heavy fire. By his coolness he not only saved many lives but gave great confidence and encouragement to the men around him.

Temp. Capt. Edward Seguier Sowerby, M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty in guiding parties of bearers and bringing back wounded in the open over most difficult ground and under heavy fire. On one occasion he led a party through a heavy barrage and succeeded in collecting many wounded from close to the enemy's line.

Temp. Capt. William Turner, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He had on two occasions to change his regimental post on account of its being destroyed by shell fire, but continued to dress the wounded of three battalions throughout the day in the open under heavy fire.

Lieut. Sammuel Vidot, Royal Army Medical Corps, Special Reserve.
For conspicuous gallantry and devotion to duty. He carried on his work continually under heavy shell fire throughout the operation, and stayed behind after the battalion was relieved to attend to the wounded. He had previously entered a dug-out which was full of fumes and rescued a wounded officer.

Temp. Capt. John Alexandra Vlasto, M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He attended to over one hundred cases

of wounded under extremely heavy shell and rifle fire. During a gas and smoke cloud he worked ceaselessly in the firing line, attending to men gassed and wounded. His courage and total disregard for his personal safety were a splendid example to all around him, and were the means of saving many lives.

CHANCERY OF THE ORDER OF SAINT MICHAEL AND SAINT GEORGE.

Downing Street,
March 8, 1918.

The King has been graciously pleased to give directions for the following appointment to the Most Distinguished Order of Saint Michael and Saint George, for services rendered in connexion with Military Operations in the Field. To be dated January 1, 1918.

To be an Additional Member of the Third Class, or Companion of the said Most Distinguished Order :—

Lieut.-Col. (Temp. Col.) Henry Nason Dunn, D.S.O., M.B., Royal Army Medical Corps.

War Office,
March 8, 1918.

His Majesty the King has been graciously pleased to approve of the undermentioned Honour and Reward for valuable services rendered in connexion with the War. Dated January 1, 1918.

TO BE BREVET LIEUTENANT-COLONEL.

Major E. S. Forde, L.R.C.P., L.R.C.S., Royal Army Medical Corps.

War Office.
March 8, 1918.

His Majesty the King has been graciously pleased to approve of the undermentioned Reward for Distinguished Service in the Field. Dated January 1, 1918.

AWARDED THE DISTINGUISHED SERVICE ORDER.

Major (Acting Lieut.-Col.) Henry Fulton, Royal Army Medical Corps.

War Office,
March 11, 1918.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for Distinguished Services rendered during the course of the campaign. His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question :—

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Croix de Guerre.

Lieut.-Col. (Temp. Col.) John Donald Alexander, D.S.O., M.B., Royal Army Medical Corps.
Lieut.-Col. Arthur Chopping, C.M.G., Royal Army Medical Corps.
Temp. Capt. Myer Coplans, D.S.O., M.D., Royal Army Medical Corps.
Capt. Thomas Frederick Corkill, M.B., Royal Army Medical Corps (Special Reserve).
Brevet Col. Stevenson Lyle Cummins, C.M.G., M.D., Royal Army Medical Corps.
Col. Samuel Guise Moores, C.B., C.M.G.
Temp. Capt. John Henry Herbert Pearson, M.D., Royal Army Medical Corps.
Surg.-Gen. Robert Porter, C.B., M.B.
Surg.-Gen. Sir Arthur Thomas Sloggett, K.C.B., K.C.M.G., K.C.V.O., F.R.C.S.. K.H.S.
Major Herman Stedman, F.R.C.S., L.R.C.P., late Royal Army Medical Corps.

COMMUNIQUÉ.

N.B.—This list of mentions is for publication in the Press only, and will not be gazetted.

War Office,
March 13, 1918.

The names of the undermentioned have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the War, and when applicable an entry will be made in the records of service of Officers and other ranks :—

ROYAL ARMY MEDICAL CORPS.

Temp. Capt. R. M. Beaton.
Temp. Major O. Challis.
Temp. Capt. O. C. M. Davis, M.B.
Temp. Major J. A. Devine, M.D., D.S.O.
Temp. Capt. W. V. Eaves, M.D.
Capt. (Acting Major) H. F. Everett (Territorial Force).
Major F. G. Faichnie.
Temp. Capt. W. T. Finlayson.
Capt. A. G. R. Foulerton.
Capt. C. C. Frye, F.I.C. (Territorial Force).
Lieut.-Col. J. B. Gibbons, late Indian Medical Service.
Lieut. (Temp. Capt.) W. Gilliatt (Territorial Force).
Major A. M. H. Gray (Territorial Force).
Temp. Major W. D. Home, M.D.
Temp. Capt. S. Infield.
Qmr. and Hon. Lieut. T. Jones (Territorial Force).
Temp. Capt. J. Keenan, F.R.C.S.I.
Temp. Major T. M. Kendall.
Lieut. (Temp. Capt.) J. P. Kinloch, M.D. (Territorial Force).
Capt. and Brevet-Major R. W. D. Leslie.
Major H. H. Littlejohn, M.D., F.R.C.S.Edin. (Territorial Force).
Temp. Capt. G. Marshall, M.B.
Major G. H. Rees, M.B.
Temp. Major A. W. Robertson.
Qmr. and Hon. Lieut. W. E. Squire.
Capt. J. B. Steverson, M.C., M.B.
Temp. Lieut. R. Taylor, M.B.
Qmr. and Hon. Lieut. W. Tuson.
Major F. C. Whitmore (Territorial Force).
Qmr. and Hon. Lieut. J. W. Willsher.
Temp. Capt. D. Wilson, M.B.
Major Sir E. S. Worthington, C.M.G., M.V.O.
Temp. Major (Acting Lieut.-Col.) W. P. Yetts.
No. 26813 Staff-Serjt. F. Wills.

Lieut.-Col. C. Milne, M.B., Indian Medical Service.

Mauritius.

Lieut.-Col. D. Lawson.

Gibraltar.

Lieut.-Col. G. Dansey-Browning.
Temp. Capt. E. V. Hunter.
Temp. Capt. (Local Major) C. G. H. Moore.
Qmr. and Hon. Capt. W. T. Spencer.

Jamaica.

Lieut.-Col. J. H. A. Rhodes.
No. 2242 Cpl. J. Thompson.

Jersey.

Temp. Major (Surg.-Gen., Royal Jersey Militia) A. C. Stamberg, M.D.

Malta.

Capt. (Temp. Local Major) J. A. Arkwright.
Capt. (Local Major) G. R. Bruce, Special Reserve.
Major J. C. G. Carmichael.
Major (Local Lieut.-Col.) C. H. Carr.
Temp. Major G. Graham.
Temp. Capt. G. Hamilton.
Temp. Major T. Mackenzie.
Qmr. and Hon. Capt. E. W. Newland.
Capt. (Temp. Local Major) C. R. Nicholson.
Major (Temp. Local Lieut.-Col.) A. C. O'Sullivan.
Capt. A. Patrick.
Capt. (Temp. Local Major) H. J. Pickering.
Capt. (Temp. Local Major) C. H. G. Prance.
Capt. (Temp. Local Major) A. B. W. Rust.
Capt. (Temp. Local Major) H. H. Serpell.
Temp. Capt. (Local Major) E. G. B. Starkie.
No. 50225 Pte. (Acting Cpl.) H. Ackroyd.
No. 14461 Serjt.-Major A. Baker.
No. 26 Serjt. (Acting Qmr.-Serjt.) F. Bax.
No. 58577 Staff-Serjt. (Acting Serjt-Major) W. A. Browne.
No. 15671 Qmr.-Serjt. (Acting Qmr.) R. W. Cole.
No. 50965 Pte. A. Davis.
No. 5171 Serjt. (Acting Serjt.-Major) W. E. L. Eason.
No. 18613 Serjt.-Major C. F. Grant.
No. 44987 Serjt. (Acting Qmr.) J. W. Griffiths.
No. 15813 Qmr.-Serjt. (Acting Serjt.-Major) A. V. Heggie.
No. 19867 Pte. (Acting Serjt.) W. H. Hughes.
No. 53243 Serjt. (Acting Serjt.-Major) W. King.
No. 12058 Serjt.-Major A. W. Pettley.
No. 44071 Serjt. (Acting Serjt.-Major) H. J. Randall.
No. 52898 Pte. (Acting Serjt.) T. A. Scott.
No. 43181 Pte. (Acting Serjt.) A. A. Smith.
No. 12582 Serjt.-Major J. Whiting.

His Majesty the King has been graciously pleased to approve of the award of a Bar to the Military Medal to the undermentioned Non-commissioned Officers and Men:—

No. 66354 Pte. (Acting Serj.) H. W. Dutton, M.M., Royal Army Medical Corps (Coventry). (M.M. gazetted February 1917.)

No. 337246 Serjt. (Acting Company Serjt.-Major) W. Miller, M.M., Royal Army Medical Corps (Liverpool). (M.M. gazetted March 12, 1917.)

No. 47455 Pte. H. G. Fulljames, M.M., Royal Army Medical Corps (Camberwell). (M.M. gazetted June 18, 1917.)

No. 301239 Pte. G. Cruickshank, M.M., Royal Army Medical Corps (Aberdeen). (M.M. gazetted July 18, 1917.)

No. 510220 Pte. J. N. Hawken, M.M., Royal Army Medical Corps (St. George's Square). (M.M. gazetted November 2, 1917.)

No. 341318 Serjt. T. R. Jackson, M.M., Royal Army Medical Corps (St. Helens). (M.M. gazetted January 14, 1918.)

His Majesty the King has been graciously pleased to approve of the award of the Military Medal for Bravery in the Field to the undermentioned Non-commissioned Officers and Men :—

ROYAL ARMY MEDICAL CORPS.

No. 89018 Pte. E. Airey (East Gateshead).
No. 326016 Pte. C. Allison (Glasgow).
No. 45507 Pte. A. Ansell (Warlingham).
No. 419459 Pte. G. W. Baker (Leicester).
No. 538194 Pte. W. R. Baker (East Dulwich).
No. 405142 Pte. S. Barker (Sheffield).
No. 510480 Serjt. J. B. Barry (Chard).
No. 90014 Pte. E. Bell (Luton).
No. 47037 Qmr.-Serjt. (Acting Serjt.-Major) H. C. Bell (Belfast).
No. 74767 Pte. W. E. Bennellick (Camborne).
No. 512556 Pte. J. A. C. Bennett (Beckenham).
No. 22667 Pte. L. Birkby (Bradford).
No. 6474 Pte. E. C. Bishop (Liverpool).
No. 33747 Pte. (Acting Serjt.) G. S. Blow (Walthamstow).
No. 473453 Pte. F. S. Blows (Cherryhinton).
No. 538128 Pte. A. Boast (Huddersfield).
No. 403165 Pte. W. H. Bourne (Castleford).
No. 473168 Cpl. (Acting Lance-Serjt.) G. Brasnett (Manningtree).
No. 512550 Pte. J. C. Buckley (Hornchurch).
No. 74440 Pte. E. C. Callard (Exeter).
No. 514070 Pte. E. Campion (St. John's Hill, S.W.).
No. 419382 Pte. J. A. Cartwright (Leicester).
No. 337605 Pte. J. Charles (Liverpool).
No. 341493 Pte. S. Clarke (St. Helens).
No. 41206 Lance-Cpl. S. J. Clarke (Belfast).
No. 19731 Pte. A. Clements (Leytonstone).
No. 47223 Pte. A. Clifton (East Bergholt).
No. 508259 Pte. N. R. Cook (Rochford).
No. 71908 Pte. J. Cowan (Kirkconnel).
No. 459278 Pte. J. M. Craze (Camborne).
No. 457400 Pte. F. A. Crispin (South Brent).
No. 5313 Pte. A. W. Crowther (Shorncliffe).
No. 341650 Pte. F. Cunningham (St. Helens).
No. 337250 Pte. S. Davies (Liverpool).
No. 512408 Pte. W. G. Dawson (Faversham).
No. 536329 Pte. H. E. Deere (Cardiff).
No. 473050 Pte. G. W. Dennant (Ipswich).
No. 536439 Pte. A. Douglas (Drury Lane, W.C.).
No. 337317 Pte. W. Duke (Liverpool).
No. 16979 Serjt. (Acting Staff Serjt.) R. V. V. Egan (Hyde Park, W.).
No. 55285 Serjt. R. Fallowfield (Strines).
No. 53352 Pte. D. Farnan (Dunmurry).
No. 67964 Pte. D. Fielder (Lower Swanwick).
No. 25133 Pte. J. Fielding (Blackburn).
No. 337527 Pte. R. A. Finch (Liverpool).
No. 71655 Cpl. W. H. Folley (Maidenhead).
No. 534100 Pte. N. Foord (Crayford).
No. 9607 Cpl. J. Fowler (Blackburn).
No. 71816 Lance-Cpl. C. E. Francis (Liverpool).
No. 534036 Serjt. H. Gibbs (Belvedere).
No. 7892 Pte. T. H. Gibson (Manchester).
No. 459246 Cpl. C. P. Gill (Camborne).
No. 32209 Pte. W. Guthrie (Londonderry).
No. 534043 Pte. M. Hallaway (Dartmouth).
No. 510237 Pte. H. H. Hand (Newcastle-under-Lyme).
No. 39891 Pte. H. J. Harding (Bolney).
No. 47431 Pte. H. Heath (Walthamstow).
No. 71954 Pte. H. Hewson (Luton).
No. 403567 Lance-Cpl. J. Hillerby (Shipley).
No. 76127 Pte. W. Holden (Accrington).
No. 75076 Pte. J. H. Holdsworth (Pitmoor).
No. 4712 Pte. W. C. Holloway (Manchester).
No. 34680 Pte. (Acting Serjt.) G. E. Hughes (Liverpool).
No. 337234 Pte. H. Jackson (Liverpool).
No. 69566 Pte. W. Jackson (Manchester).
No. 536442 Pte. H. James (Leighton Bussard).
No. 316104 Pte. A. Junor (Glasgow).
No. 69320 Pte. J. Kehoe (Newton-le-Willows).
No. 419378 Pte. C. Kingston (Sutton Bridge).
No. 51292 Pte. W. C. A. Laing (Peebles).
No. 405088 Cpl. H. H. Lake (Sheffield).
No. 9680 Pte. A. Larking (Thorpe Audlin).
No. 75141 Pte. W. Laws (Willington).
No. 48522 Pte. D. Lockray (Castle Douglas).
No. 45453 Pte. J. Masters (Wimbledon).
No. 459014 Serjt. A. W. Matthews (Plymouth).
No. 408026 Pte. J. W. McCullough (Leeds).
No. 316069 Pte. N. McMillan (Glasgow).
No. 536411 Pte. J. W. Milton (Battersea).
No. 41183 Pte. J. E. Mitchell (Belfast).
No. 47040 Staff-Serjt. D. Moffatt (Bailieborough).
No. 508067 Lance-Cpl. V. Mossman (Brixton).
No. 64558 Pte. A. D. Murray (Croick, Forsinard).
No. 75030 Pte. J. Newman (Darlaston).
No. 512231 Lance-Serjt. (Acting Serjt.) P. Oakenfull (Westcliff-on-Sea).
No. 401152 Pte. A. D. Odgers (Leeds).
No. 538267 Pte. H. Parris (Wimbledon).
No. 90698 Pte. F. G. Paul (Swindon).
No. 403249 Pte. G. J. Peakman (Leeds).
No. 339649 Pte. R. Peers (Liverpool).
No. 46538 Pte. (Acting Cpl.) D. Philip (Glasgow).
No. 3134 Pte. A. Pirie (Elgin).
No. 536365 Serjt. W. H. L. Price (Sydenham).
No. 39680 Serjt. E. A. Rees (Small Heath).
No. 54889 Cpl. A. E. Reese (Clun).
No. 538177 Pte. E. Rocker (Hanwell).

No. 75014 Pte. A. Rogerson (Newcastle, Staffs).
No. 6726 Cpl. (Acting Serjt.) W. S. Salter (Bickleigh).
No. 54658 Pte. J. Savage (Oswaldtwistle).
No. 508271 Pte. A. Schofield (Fulham).
No. 512410 Lance-Cpl. J. H. Searle (Hassocks).
No. 538101 Serjt. A. W. Shaw (Notting Hill).
No. 47468 Pte. W. Short (Yoxford).
No. 457034 Pte. H. Smith (Teignmouth).
No. 73193 Pte. (Acting Lance-Cpl.) J. T. Smith (Newtown, Linford).
No. 53120 Pte. R. W. Southard (Fulham).
No. 461503 Pte. W. A. Spooner (Rotherhithe).
No. 64670 Pte. (Acting Cpl.) J. H. Stewart (Pettigo, co. Galway).
No. 54325 Pte. B. Strickland (Preston).
No. 401160 Pte. G. D. Summerscales (Leeds).
No. 11636 Pte. J. Supple (Clyduff).
No. 301450 Pte. J. W. Sutherland (St. Helens).
No. 3137 Pte. A. C. Swan (E. Glasgow).
No. 538285 Lance-Cpl. H. Symons (Cambridge).
No. 301173 Pte. W. W. Taylor (Aberdeen).
No. 457139 Pte. A. W. Thackway (Bath).
No. 3800 Pte. J. Thompson (Agher).
No. 419313 Lance-Cpl. O. Thompson (Leicester).
No. 538060 Serjt. T. H. Treadwell (Chelsea).
No. 66583 Pte. A. B. Turner (Cheltenham).
No. 18886 Pte. P. Walsh (Rochdale).
No. 90005 Pte. W. Warren (Luton).
No. 64481 Pte. (Acting Lance-Cpl.) A. J. Watts (Sapcote).
No. 512303 Lance-Cpl. H. D. Watts (Beckenham).
No. 473305 Pte. H. T. Webb (Newmarket).
No. 71968 Pte. (Acting Cpl.) P. G. Williams (Peckham).
No. 508136 Pte. E. C. Willoughby (Cranley Gardens).
No. 301334 Pte. H. Wilson (Aberdeen).
No. 337351 Pte. R. Wilson (Larne).
No. 64066 Pte. (Acting Cpl.) J. C. Wood (East Hebburn).
No. 508372 Pte. H. P. Wright (Greenhithe).
No. 403491 Pte. C. Yates (Bradford).

His Majesty the King has been graciously pleased to award the Meritorious Service Medal to the undermentioned Warrant Officers, Non-commissioned Officers and Men, in recognition of valuable services rendered with the Armies in the Field during the present War:—

ROYAL ARMY MEDICAL CORPS.

No. 60208 Pte. (Acting Lance-Serjt.) G. W. Beach (Uxbridge).
No. 17749 Qmr.-Serjt. (Acting Serjt.-Major) J. Black (Oldham).
No. 11236 Serjt. B. A. Embelin (Dublin).
No. 5049 Pte. A. Kellett (Hunslet).
No. 18656 Staff-Serjt. (Acting Serjt.-Major) H. G. Maywood (London. W.).
No. 322005 Staff-Serjt. (Acting Qmr.-Serjt.) W. G. Patterson (Dysart, Fife).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.
March 15, 1918.

The King has been graciously pleased to give orders for the following appointments to the Most Excellent Order of the British Empire for services in connexion with the War in France, Egypt and Salonika. The appointments to date from January 1, 1918:—

To be Officer of the said Most Excellent Order:—

Lieut.-Col. Charles Edward Percy Fowler, Royal Army Medical Corps.

War Office,
March 18, 1918.

With reference to the awards conferred as announced in the *London Gazette*, dated October 27, 1917, the following are the statements of services for which the decorations were conferred:—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Temp. Capt. John Caruthers Sale, M.C., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an attack. He collected the wounded over a large tract of country exposed to heavy fire, and continuously went out by night in advance of the front line searching for the wounded, many of whom he brought back over most difficult ground and under heavy fire. His coolness and determination were a splendid example to his stretcher-bearers.

AWARDED A BAR TO THE MILITARY CROSS.

Temp. Capt. Hugh Ross McIntyre, M.C., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. When in charge of the evacuation of the wounded he from time to time led his stretcher-bearers and cleared the wounded, although exposed to fire from snipers. He worked untiringly and incessantly for three days without sleep, and it was due very greatly to his efforts that the regimental aid posts were kept clear of

wounded, and cases quickly evacuated to the advanced dressing station. He is fearless in the face of danger, and by his splendid courage and example he inspired confidence in his men.

AWARDED THE MILITARY CROSS.

Temp. Lieut. Henry Marston Layard Crawford, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He dressed and collected the wounded under heavy shell fire, and on the withdrawal he remained with the rearguard, still under heavy fire, collecting more wounded. By his pluck and determination he succeeded in bringing in all his wounded, though compelled to make a wide detour through exceptionally heavy and difficult country.

Temp. Qmr. and Hon. Lieut. Charles Elliot, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. Whilst in charge of the arrangements for the evacuation of the wounded, he time after time took men out under heavy shell fire and repaired the line. He frequently volunteered to go forward and find out the position of wounded men lying out in the open. He worked incessantly for fifty hours without rest under fire, and showed a splendid example to others.

Temp. Capt. Leslie Haden Guest, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. On the night of an attack he gallantly led his stretcher squads under heavy shell fire and collected wounded who were lying out on newly captured ground. By his courageous example and disregard of danger he was the means of saving many wounded men.

Temp. Capt. William Llewellyn Aplin Harrison, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He established his aid post within 200 yards of the front line as soon as the objective had been reached and thereby saved many lives. Though his aid post was twice destroyed by shell fire he continued at work with complete disregard of danger, inspiring all who came in contact with him by his splendid example.

Temp. Capt. William George Johnston, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. Whilst in command of the stretcher-bearers evacuating the wounded he worked under shell fire for fifty-five hours, leading his bearers time after time to collect wounded lying out in the open. On another occasion he went out under heavy shell fire and succeeded in getting out alive some men who had been buried in the forward trenches. His fearless conduct, disregard of personal danger and devotion to duty saved many valuable lives.

Temp. Capt. Robert Kennon, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. During the recent operations this officer continued for three days to dress wounded, during which period he was continually under heavy shell fire, and his dressing station was blown in. With the greatest coolness and devotion to duty he continued his life-saving work, and was a splendid example to all ranks.

Temp. Capt. John Kirton, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty during an action. He went forward under shell fire to dress and collect wounded and help and encourage the stretcher-bearers at their duties, working for five consecutive days without rest. It was largely owing to his excellent work that the evacuation of the wounded of the division was successfully carried out, and by his efforts many wounded men were got into safety.

*Capt. John Joseph Harper Nelson, M.D., Indian Medical Service.

For conspicuous gallantry in action. He tended the wounded in the open for a long period, although exposed to heavy fire of all descriptions. He showed fearlessness throughout, and his example was of great value to all.

Temp. Capt. Wilfrid John Pearson, M.B., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. When in charge of the evacuation of the wounded, he worked under heavy shell fire for fifty hours without rest, and it was largely due to his untiring efforts that the wounded in this sector were got away so quickly. On one occasion, when caught in the barrage of the enemy's heavy guns, and though severely shaken, he continued to work without intermission, his untiring labours being instrumental in saving many valuable lives.

Note.—Since the publication of these officers' names in the *Gazette* of October 27, 1917, promotion has, in some cases been conferred, and the ranks herein shown are not therefore in all cases those now held.

*The name marked thus has not previously appeared in the *Gazette*.

War Office,
March 22, 1918.

With reference to the awards conferred as announced in the *London Gazette*, dated November 19, 1917, the following are the statements of services for which the decorations were conferred :—

AWARDED THE DISTINGUISHED SERVICE ORDER.

Temp. Capt. Gordon Wilson Armstrong, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked in the open under continuous and heavy shell fire and dressed and evacuated 117 stretcher cases from his aid post in twenty-

seven hours. Later on, while the shelling was very severe, he volunteered to go in aid of an office and an orderly, carrying them to the aid post one after another on his back. Though wounded during the second journey he refused to leave his post, remaining with his battalion until it was relieved.

AWARDED A BAR TO THE MILITARY CROSS.

Capt. William McMeekin Chesney, M.C., M.B., Royal Army Medical Corps (Special Reserve).
For conspicuous gallantry and devotion to duty when in charge of stretcher-bearers. He continually visited the forward aid posts throughout the day and supervised the evacuation of the wounded under very heavy shell and machine-gun fire. Though wounded he refused to quit his post until he had rendered a valuable report on the evacuation of the wounded. He worked with indefatigable energy and great courage throughout.

Temp. Capt. Robert Welton Hogg, M.C., M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty while in charge of a forward bearer post he worked indefatigably for three days, evacuating the wounded from the regiment aid posts in the line, moving about continuously under heavy enemy barrages. It was entirely due to his fine example and untiring energy that over 200 stretcher cases were safely got away from the front during the first six hours of the attack.

Temp. Capt. Hubert Francis Wilson, M.C., M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He established his regimental aid post in a shell hole close to the firing line, and maintained it in spite of heavy shell fire. During an attack he went forward under heavy fire and attended to the wounded, who could not be brought in by the stretcher-bearers. His devotion to duty and unceasing energy is deserving of the highest praise.

AWARDED THE MILITARY CROSS.

Capt. Bernard Gordon Beveridge, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He was in charge of a divisional collecting post and relay bearer posts during an action, and organized and carried out the evacuation of the wounded over the open under continuous fire. It was only by his unfailing courage and energy that the work was successfully accomplished.

Temp. Capt. Dimoek Stanley Cassidy, M.D., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. When a party of men were gassed in a mine-shaft he went down and remained there all night preparing to render first-aid. He did not leave his post even when seriously affected by gas.

Capt. George Eustace, M.D., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He was going forward with a party which came under a very heavy barrage. He remained out in the barrage attending to the wounded regardless of danger, and carried one wounded man several hundred yards through the barrage to safety.

Capt. Frederick George Harper, M.D., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He worked incessantly, attending to the wounded under heavy shell fire. He set a magnificent example to all, and undoubtedly saved many lives.

Temp. Capt. James Jack, M.B., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He established forward collecting posts and dressed and removed the wounded with great coolness and disregard of danger during a period of four days and nights. Most of the time he was under heavy shell fire, and set a fine example of courage to his men.

Capt. Harold Howard Lesson, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He showed the utmost courage and total disregard for personal safety when commanding stretcher-bearer squads. His splendid example under heavy shell fire inspired those working under him.

Temp. Capt. Charles Fellowes Maclachlan, Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty. He worked continuously for forty-eight hours under heavy shell fire, attending to the wounded, much of his work being done in the open. His services were of the greatest value, and he set a magnificent example to all.

Temp. Capt. Peter Malcolm MacLachlan, M.D., Royal Army Medical Corps.
For conspicuous gallantry and devotion to duty during an attack. As soon as the battalion captured its objective he went to the front line under heavy shell fire to bring back the wounded. He did excellent work under heavy fire throughout the operations, and showed great gallantry and disregard of danger.

Capt. James Stewart McConnachie, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He was in charge of a divisional collecting post during an attack, and organized and carried out the evacuation of the wounded under heavy fire, in the course of which his post was several times hit. He carried on his work during several counter-attacks by the enemy, and set a splendid example of coolness and courage.

Qmr. and Hon. Lieut. Francis Poole, Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He remained at the advanced collecting station for several days organizing the rationing of the wounded, and daily visited the relay posts and regimental aid posts with supplies of medical comforts and dressings. During heavy shelling he helped to withdraw the wounded, and lives were saved by his action and example. He has continuously done excellent work.

Temp. Capt. Alexander Waugh Young, M.D., Royal Army Medical Corps.

For conspicuous gallantry and devotion to duty. He worked untiringly in attending to the wounded, continually going out into the most forward area under heavy machine-gun fire with his men, encouraging and directing them in their work. It was due to him that nearly 200 cases were evacuated from the line.

Note.—Since the publication of these Officers' names in the *Gazette* of November 19, 1917, promotion has, in some case, been conferred, and the ranks herein shown are not, therefore, in all cases those now held.

War Office,
March 25, 1918.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for Distinguished Services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the decorations and medals in question.

DECORATIONS AND MEDALS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

Order of the Crown of Italy. Cavalier.

Temp. Major (Acting Lieut.-Col.) Ernest Frederick Eliot, F.R.C.S., Royal Army Medical Corps.

Temp. Capt. Reginald Hutchinson Lucas, M.C., Royal Army Medical Corps.

Order of the Crown of Italy. Silver Medal for Military Valour.

106120 Pte. Frank France, Royal Army Medical Corps (Bolton).

War Office,
March 26, 1918.

His Majesty the King has been pleased to confer the undermentioned rewards for Gallantry and Distinguished Service in the Field. The acts of gallantry for which the decorations have been awarded will be announced in the *London Gazette* as early as practicable.

AWARDED THE MILITARY CROSS.

Royal Army Medical Corps.

Capt. Alan Colpitts Ainsley.
Temp. Capt. William Kenneth Bigger.
Capt. William Edward Hugh Bull.
Temp. Capt. Nicholas Marshall Cummins, M.B.
Capt. William Goldie, M.B.
Temp. Capt. Benjamin Knowles, M.B.
Capt. Percival John Moir, M.B.
Temp. Capt. Rex Stansfield.
Capt. Bryan Montague Tuke, Spec. Res.
Capt. Rankine Greig Walker, M.B.

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Temp. Lieut. V. K. Apte, I.M.S.
Lieut. Claude Wells Woolloton Baxter, I.M.S.
Capt. Charles Aubrey Godson, I.M.S.
Capt. Charles Newton Davies, M.B., I.M.S.

The following is the correct description of an Officer upon whom a reward has recently been conferred:—

Major (Temp. Lieut.-Col.) Charles Algernon Stidston, D.S.O., M.C., R.A.M.C. (D.S.O. gazetted February 4, 1918.)

War Office,
March 26, 1918.

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for Distinguished Service in the Field. Dated January 1, 1918.

TO BE BREVET LIEUTENANT-COLONELS.

On Retired List, Reserve of Officers, Special Reserve, New Army or Territorial Force, in the case of Officers belonging to these categories, as applicable.

Major (Temp. Lieut.-Col.) R. M. Barrow, I.M.S.
Major (Temp. Lieut.-Col.) M. Mackelvie, M.B., F.R.C.S.Edin., I.M.S.

His Majesty the King has been graciously pleased to approve of the undermentioned rewards for Distinguished Service in the Field. Dated January 1, 1918.

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. J. Scott, M.B., I.M.S.

AWARDED THE MILITARY CROSS.

Capt. James Dunlop Kidd, M.D., Royal Army Medical Corps.

War Office, *April* 2, 1918.

His Majesty the King has been graciously pleased to approve of the award of the Military Medal to the undermentioned Men:—

No. 30825 Pte. C. Bull, Royal Army Medical Corps (Romford).
No. 101731 Pte. G. Glaze, Royal Army Medical Corps (Smallthorne).
No. 102037 Pte. A. C. Goodwin, Royal Army Medical Corps (Bollington).

War Office, *April* 4, 1918.

The following are among the decorations and medals awarded by the Allied Powers at various dates to the British Forces for Distinguished Services rendered during the course of the campaign.

His Majesty the King has given unrestricted permission in all cases to wear the decorations and medals in question.

DECORATIONS CONFERRED BY H.H. THE SULTAN OF EGYPT.

Order of the Nile. 4th Class.

Captain William Edward Marshall, M.C., M.B., Royal Army Medical Corps.
Captain William Hubert Milligan, Royal Army Medical Corps.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

NOTICE.

THIS Fund provides annuities of £50 a year (together with any additional benefits which may be available from distribution of surplus, which at present, in the majority of cases amount to a bonus of £200 to the widow) to the widows of subscribers and to their children under 21 years of age. The annual subscription varies according to the ages of husband and wife: e g., in the case of a husband aged 30, and wife aged 25, it would amount to £14 18s. 6d.; where husband and wife were both aged 28 it would be £12 19s. 11d.

The Committee have been able to reduce the extra war charge to one of 25 guineas per annum, in addition to the normal annual subscription according to scale. It has also been resolved that officers gazetted to permanent commissions in the Corps on January 1, 1917, and up to May 22, 1917, shall be eligible for membership on the above terms. The cases of those who may be gazetted later will be considered as they arise.

The Secretary will be glad to give any further information as to details.

3, *Homefield Road*, *Wimbledon, S.W.*

J. T. CLAPHAM, *Captain*, *Secretary.*

SUMMARY OF THE PROCEEDINGS OF A MEETING OF THE COMMITTEE WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE, ON MONDAY, APRIL 15, 1918.

Present:

Dep.-Surg.-Gen. W. G. Don, Vice-President, in the Chair.
Surg.-Gen. W. S. M. Price, Vice-President.
Surg.-Gen. Sir H. R. Whitehead, K.C.B.
Lieut.-Col. J. More Reid.
Lieut.-Col. P. S. O'Reilly, C.M.G.

(1) Surg.-Gen. Sir H. R. Whitehead, K.C.B., took his seat on the Committee, under Rule XXVI.

(2) The minutes of the preceding Meeting were read and confirmed.

(3) The Accounts and Report for the year 1917 were examined and unanimously adopted.

(4) The date of the Annual General Meeting was fixed for Monday, May 20 (subsequently changed to May 13), in the Library of the Royal Army Medical College, at 3 o'clock.

(5) Lieut.-Col. G. B. Riddick was admitted a first-class married member at an annual subscription of £29 9s., together with an extra War charge of £26 5s. per annum; his membership to date from March 5.

(5*a*) The re-marriage of an annuitant, Mrs. N. Manders, was reported. The Secretary was authorized, under Rule XVII, to continue the annuity to her for the benefit of her daughter, until the latter attains the age of 21 years.

(6) Payment of annuities for the coming half-year to those on the list was sanctioned.

(7) The death was reported of Mr. H. D. Andras, F.I.A., Consulting Actuary to the Society. The Secretary was directed to forward to his widow a resolution expressing the sympathy of the Committee, and their high appreciation of the services rendered to the Society by Mr. Andras.

The question of the appointment of an Actuary in his place was considered; but it was not considered desirable to make one until after further inquiry.

(8) The Secretary reported that the half-yearly interest on £124,000 five per cent War stock, due on June 1 next, would amount to £3,100, the greater part of which should be available for investment. It was resolved that, subject to the advice of the Hon. Treasurer, Sir James McGrigor, Bt., and to the approval of the Trustees, the available cash surplus, up to a total of £3,000, be invested in five per cent National War Bonds.

(9) Should any officers, other than those already eligible for membership, be gazetted to permanent commissions in the Corps, before the date of the next meeting of the Committee, it was resolved that they be eligible for membership on the present terms, viz., at an extra War charge of 25 guineas per annum, in addition to the normal annual subscription according to scale.

(10) Payment of the audit fee for the past year to Messrs. Deloitte and Co. was sanctioned.

(11) Payment of the Secretary's salary for the past quarter was sanctioned, as also of office allowance and refund of petty cash.

3, *Homefield Road*,
Wimbledon, S.W.

J. T. CLAPHAM, *Captain*,
Secretary.

REPORT OF THE COMMITTEE OF MANAGEMENT TO THE MEMBERS OF THE ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND FOR THE YEAR ENDED DECEMBER 31, 1917.

The Committee beg to present the following Report on the affairs of the Society, and to submit the accounts for the year ended December 31, 1917.

During the past year the deaths of three married and one unmarried members have been reported, none of whom were on the Active List. Among them, deeply regretted, was Lieut.-Col. Alfred F. S. Clarke, who for many years took the keenest interest in the management of the Society, of which for some time he was one of the Trustees. One unmarried member, Lieut.-Col. W. M. Harman, has resigned; he had subscribed to the funds of the Society for fifty years. Two married members have joined; and there are three fresh annuitants, the bonus to one of whom, owing to delay in reporting, does not appear in the accounts. All of them are entitled to the gratuity on the higher scale of £200. Four annuitants have died during the year. The total number of members is now 165, of whom 10 are unmarried, and of annuitants 67.

The Committee much regret to record the death of the Consulting Actuary, Mr. H W. Andras, F.I.A. Under his guidance the Society was re-organized in 1905. He took the greatest interest in its welfare, and much of its success in recent years is due to his expert advice. His loss will be much felt.

The number of casualties among officers of the Corps up to the end of 1916 having proved less than was expected, and the financial position of the Society being most satisfactory, the Committee, with the concurrence of the Actuary, were able in the spring of 1917 to reduce the extra war charge to new members from 50 guineas per annum to 25 guineas, and to make an equivalent refund to such members as had already paid the full charge. Officers whose permanent commissions date from January, 1917, were made eligible for membership at the above annual rate, and notices were sent to all of them stating the benefits provided by the Society. They numbered as gazetted 111, of whom five have been killed in 1917. So far only one has joined the Society, but the proportion of married men amongst them is not yet known.

As far as can be ascertained the deaths among regular officers on the Active List since the outbreak of war have been seventy. Of these there were killed in action, died of wounds, drowned or died as prisoners of war: In 1914, 22; in 1915, 11; in 1916, 6; in 1917, 13. As to the remaining eighteen, it is not known in what proportion death was directly or indirectly due to conditions of service. It must also be remembered that the effects of the War in an increased death-rate amongst members are likely to be seen in future years.

Considerable changes were made during the last year in the investments of the Society, but, as most of them occurred in the early part of the year, mention of such was made in the last Report. As, however, these changes are now shown in the accompanying Balance Sheet for the first time, it may be well to refer to them again.

For many years the greater part of the Society's funds had been on deposit with the National Debt Commissioners, for the most part at £3 16s. per cent per annum. The whole of the then balance, amounting with interest to £104,386 18s. 9d., was withdrawn in February, 1917, and invested in the 5 per cent War Loan 1927/47. That sum, together with conversions and surplus funds of the Society, amounting in all to £124,000, was invested as follows:—

By investment of £104,386 18s. 9d. as above	£109,880	19	8
,, ,, £2,407 17s. 4d. cash surplus 1917 ..	2,540	2	10
By conversion of £10,000 4½ per cent War Stock 1925/45 and £1,000 5 per cent Exchequer Bonds, 1920 ..	11,578	17	6
Total 5 per cent War Stock, 1929/47	£124,000	0	0

As the result of these Investments the income of the Society has been increased by £1,600 per annum.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

ACCOUNTS FOR THE YEAR 1917.

(In the form prescribed for the Annual Return of a Registered Friendly Society.)

(A) BENEFIT FUND.

DR. INCOME.	£ s. d.	CR. EXPENDITURE.	£ s. d.
Members' Subscriptions	2,316 14 2	Widows' Annuities	3,282 19 9
Interest on Investments of Benefit Fund (including amounts recoverable in respect of Income Tax)	7,194 11 2	Bonuses to Widows	400 0 0
		Refund to Members of proportion of extra War Charges paid in 1915 and 1916	157 10 0
Total Income	£9,511 5 4	Interest on £5,868 7s. 10d. (balance of Management Fund at the end of the year 1916) at 3 per cent, transferred to Management Fund	176 1 0
Amount of Benefit Fund at the beginning of the year, as per last Balance Sheet	138,170 8 10	Total Expenditure	£4,016 10 9
		Amount of Benefit Fund at the end of the year, as per Balance Sheet (C)	143,665 3 5
	£147,681 14 2		£147,681 14 2

(B) MANAGEMENT FUND.

DR. INCOME.	£ s. d.	CR. EXPENDITURE.	£ s. d.
Interest for one year on £5,868 7s. 10d. at 3 per cent, transferred from Benefit Fund	176 1 0	Secretary's Salary	150 0 0
Amount of Management Fund at the beginning of the year, as per last Balance Sheet	5,868 7 10	Actuary's Fee	10 10 0
		Auditors' Fee	10 10 0
		Office Allowance	60 0 0
		Printing, Postages, and Stationery	16 3 5
		Total Expenditure	£247 3 5
		Amount of Management Fund at the end of the year, as per Balance Sheet (C)	5,797 5 5
	£6,044 8 10		£6,044 8 10

(C) BALANCE SHEET AT DECEMBER 31, 1917.

Dr. Liabilities.	£	s.	d.
Benefit Fund, as per Account (A)	143,665	3	5
Management Fund, as per Account (B)	5,797	5	5
Sundry Liabilities—			
Secretary's Salary (from October 1 to December 31, 1917)	37	10	0
Actuary's Fee	10	10	0
Office Allowance	15	0	0
Annuities outstanding	91	0	0
	£149,616	8	10

To the Members of the Army Medical Officers' Widows and Orphans Fund.

We have examined the above Balance Sheet with the Books and Vouchers of the Society and certify that it is in accordance therewith. The Securities and Cash Balances have been verified by us.

DELOITTE, PLENDER, GRIFFITHS AND CO., *Auditors, Chartered Accountants.*

5, *London Wall Buildings, Finsbury Circus, E.C.*
March 12, 1918.

Assets. Investments.	Rate per cent of Interest yielded £ s. d.	Cr. £ s. d.
(1) In the Public Funds—		
£124,000 0 0 War Stock, Five per Cent, 1929-1947 ..	5 5 6	117,507 6 1
3,000 0 0 National War Bonds, Five per Cent, 1927	5 0 0	3,000 0 0
5,500 0 0 Dominion of Canada Three and a Half per Cent Stock, 1930-1950 (lent to H.M. Treasury at an additional Half per Cent)	5 11 1	3,958 5 8
2,000 0 0 Newfoundland Three and a Half per Cent Stock, 1950 ..	4 16 1	1,456 17 6
(2) Upon the Security of Borough and County Rates, or other Corporate Funds—		
5,000 0 0 London County Council Three and a Half per Cent Stock	4 9 10	3,893 15 0
5,000 0 0 Metropolitan Water Board "B" Three per Cent Stock ..	4 12 1	3,259 7 6
(3) Other Securities—		
5,000 0 0 Great Western Railway Four per Cent Debenture Stock..	4 15 2	4,200 0 0
5,000 0 0 London and North Western Railway Three per Cent Debenture Stock ..	4 13 4	3,215 12 6
1,500 0 0 Caledonian Railway Four per Cent Debenture Stock ..	4 13 4	1,286 5 0
7,900 0 0 Midland Railway Two and a Half per Cent. Debenture Stock ..	4 15 8	4,130 4 4
2,100 0 0 East Indian Railway Three and a Half per Cent Debenture Stock	4 17 7	1,506 15 0
Note—A Valuation of the above Securities at middle published prices on December 31, 1917, shows a depreciation of £3,094 8s. 7d.		
Interest accrued on Investments		1,044 2 2
Income Tax recoverable		89 12 0
Cash at Bankers		1,068 6 1
		£149,616 8 10

During the past year a further sum of £3,000 from cash surplus has been invested in 5 per cent National War Bonds, which are repayable at 105 in 1927, and may be converted at any time after April 1 at the rate of £100 5 per cent War Stock for £95 nominal of National War Bonds.

It is hoped that members of the Society serving with the various Expeditionary Forces will bring to the notice of their brother officers the advantages of the Society and its very sound financial position. There must still be many whom notices, both individual and in the Corps Journal, have failed to reach.

W. G. Don, *Vice-President*,
Deputy Surgeon-General,
Chairman of the Meeting of this date.

Royal Army Medical College,
April 15, 1918.

ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

The Annual General Meeting of Subscribers to the Royal Army Medical Corps Central Mess Fund will be held in the Library of the Royal Army Medical College on Monday, June 10, 1918, following immediately that of the Royal Army Medical Corps Officers Benevolent Society. The Director-General will preside. Officers desiring information about this Fund are asked to communicate with the Honorary Secretary beforehand, so that there may be no delay in dealing with any questions which may be asked. Notice of any definite proposal which it may be desired to bring forward should be sent to the Honorary Secretary in order that it may appear on the agenda paper.

3, *Homefield Road*,
Wimbledon, S.W.

J. T. Clapham, *Captain*,
Honorary Secretary.

The Committee beg to submit the following Report on this Fund for the year 1917-18:—

The number of subscriptions (775) is slightly less than that of last year (779), but there are some twenty in arrear which will probably be paid.

It will be noticed that entrance fees appear for the first time in the Accounts. The payment of such by officers joining the Corps in the future was agreed upon at the Annual General Meeting in 1914, and those whose Commissions are dated January 1, 1917, are the first to be affected. They numbered 111 (of whom five have since been killed). A notice describing the objects of the Fund was sent to each of these, but, so far, only fifteen have become subscribers.

As to the grants made during the year, that to the Aldershot Mess was for maintenance purposes. The furniture of this Mess belongs to it, and the average number of officers dining (one regular and eight others) has been so small that the funds available for up-keep are quite inadequate. Although the London Mess is closed, it is liable for various insurances of Mess property and also for the annual contribution to the Pension Fund for Brewer and Elliott. A grant for these purposes was made. A small grant was also made, through the Aldershot Mess Committee, to the widow and orphans of the late G. Stacey, a well-known Mess servant for many years at Netley and Aldershot, for whom no pension arrangements had been made.

With the exception of the Curragh, which asked for help towards maintenance and afterwards withdrew its request, none other of the permanent messes has applied for assistance. There is reason to believe that several of them prefer to carry on without making any call on the Fund till the end of the War, when the demands upon it will be heavy.

The liability to Royal Army Medical Corps, Sierra Leone, is in respect of a sum handed over for custody at the outbreak of war.

The non-investment of cash surplus of the Fund during the past year is apparent rather than real. When the 5 per cent War Loan 1929—47 was issued in February, 1917, by the courtesy of Messrs. Holt and Co. the Cash balance of the Fund was reduced much below its customary level, in order that £400 of this Loan might be taken up, by anticipating the subscriptions for 1917—18, due a month later. The small amount of £13 3s. 3d. purchased during the past year was to bring the holding up to a round figure. It was thought advisable to show in the Balance Sheet the market value at the end of the year of the investments of the Fund.

For the past two years Aldershot and Rawal Pindi are the only messes which have applied to the Honorary Secretary for payment from the Central Fund of the joining and contributions of subscribers. The latter are reminded that they are not liable to any of the permanent messes for joining or difference-in-rank contributions; the amounts due for such should be claimed by mess secretaries from the Central Fund.

Officers on the retired list who subscribe to the Fund are considered Honorary Members of all the permanent messes of the Corps.

3, *Homefield Road*,
Wimbledon, S.W.

J. T. Clapham, *Captain*,
Honorary Secretary.

ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

Dr. CASH STATEMENT FOR THE YEAR ENDED FEBRUARY 28, 1918. *Cr.*

Income.

1917		£ s. d.
Mar. 1.	To Balance of Cash brought forward from 1916-1917	127 2 7
	,, Interest on Investments (after deducting Income Tax at 5s. in the £)	48 18 9
	,, Subscriptions of Members (775)	518 8 3
	,, Entrance Fees (15)	78 15 0
		£773 4 7

Expenditure.

1917		£ s. d.	£ s. d.
	By Grants to Messes : London	79 4 6	
	Aldershot	60 0 0	
			139 4 6
	,, Army and Navy Co-operative Society, Balance of Debt due from Scottish Command for Camp Canteen ..		6 6 2
	,, Grant to Widow and Orphans of the late Mr. G. Stacey, per Aldershot Mess Committee		15 0 0
	,, Joining, and difference-in-rank Contributions Paid to Messes on behalf of Subscribers— Aldershot	9 18 0	
	Rawal Pindi	8 4 0	
			18 2 0
	,, Purchase of £13 3s. 3d. 5 per cent. War Stock 1929/47 ..		12 10 2
	,, Auditor's Fee		3 3 0
	,, Office Expenses (for two years)—		
	Printing ..	1 19 10	
	Typing ..	1 13 2	
	Stamps ..	1 17 1	
			5 10 1
1918			
Feb. 28.	Balance of Cash carried forward to 1918-19		573 8 8
			£773 4 7

BALANCE SHEET AT FEBRUARY 28, 1918.

Liabilities.

	£ s. d.
Royal Army Medical Corps Entertainment Fund, Sierra Leone, held for ..	14 14 1
Balance	1,835 13 11
	£1,850 8 0

Assets.

	£ s. d.
Investments (valued at approximate closing prices, February 28, 1918)—	
£1,150 War Loan 5 per cent Bonds 1929-47	1,073 1 10
£200 Exchequer 6 per cent Bonds, 1920	203 17 6
Cash at Bankers	573 8 8
	£1,850 8 0

Audited and found correct
April 23, 1918. (Signed) EDMOND T. GANN.

(Signed) J. T. CLAPHAM, *Captain,*
Hon. Secretary.

ROYAL ARMY MEDICAL CORPS OFFICERS BENEVOLENT SOCIETY.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE, ON APRIL 17, 1918.

Present:

Lieut.-Gen. T. H. J. C. Goodwin, C.B., C.M.G., D.S.O., Director-General, in the Chair.
Major-Gen. Sir W. Donovan, K.C.B.
Col. H. W. Murray.
Lieut.-Col. A. B. Cottell.
Capt. J. T. Clapham.

(1) The Minutes of the last meeting held on February 27 were read and confirmed.

(2) A letter of regret was read from Surg. Gen. Sir D. Bruce for his inability to attend.

(3) The accounts for 1917 which have now been audited were read and confirmed.

(4) Correspondence was read relative to the suggested realizations of certain Railway Securities held by the Society and it was decided to take no action, but for the information of the general body of Subscribers to insert the present estimated value of these securities as well as the cost price when publishing the accounts in the Corps Journal.

(5) The applications received on behalf of orphans for assistance were considered and recommendations made for decision by the Annual General Meeting. It was also decided to recommend that when inserting the grants authorized in the Corps Journal to indicate the recipients by initials only and to omit any reference to the rank of the father.

(6) The date fixed for the Annual General Meeting, viz., Monday, June 10, was noted, and the Draft Report for the year 1917 was considered and approved.

(7) It was decided to recommend the re-appointment of Lieut.-Col. E. M. Wilson as Secretary one year from June 20, 1918.

ROYAL ARMY MEDICAL CORPS FUND (Regular Army). ROYAL ARMY MEDICAL CORPS OFFICERS BENEVOLENT SOCIETY (Regular Army).

THE Annual General Meeting of the Royal Army Medical Corps Fund will be held in the Library of the Royal Army Medical Corps College, Grosvenor Road, S.W., at 2.30 p.m., on Monday, June 10, 1918.

The Director-General will preside.

It is hoped that all subscribers who can spare the time will be present, and will freely express their views on any point connected with the Fund.

The Annual General Meeting of the Royal Army Medical Corps Benevolent Society will take place immediately afterwards.

Any officers desiring information regarding these Funds are requested to communicate with the Secretary beforehand, so that there may be no delay in dealing with any questions asked.

124, *Victoria Street, S.W.* E. M. WILSON, *Lieut.-Col., Secretary.*

ROYAL ARMY MEDICAL CORPS FUND.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT ADASTRAL HOUSE, WAR OFFICE, ON APRIL 17, 1918.

Present:

Lieut.-Gen. T. H. J. C. Goodwin, C.B., C.M.G., D.S.O., Director-General, in the Chair.
Major-Gen. G. B. Stanistreet, C.M.G., Deputy Director-General.
Major-Gen. Sir W. Donovan, K.C.B.
Colonel Sir J. Magill, K.C.B.
Lieut.-Col. A. B. Cottell.
Major P. G. Easton, D.S.O.

(1) The proceedings of the last meeting held on February 27 were read and confirmed.

(2) A letter was read from Surg.-Gen. Sir D. Bruce regretting his inability to attend.

(3) The accounts which have now been audited were approved.

(4) The question of the further collection of "Press Cuttings" relating to the services of the Royal Army Medical Corps during the War was considered, and it was decided to request Captain J. T. Clapham to continue to receive and arrange such cuttings for one year from this date, the Fund to guarantee all necessary payments. Captain J. T. Clapham who was present kindly consented to undertake the task.

(5) The Secretary submitted a rough draft of a proposed Book showing the formation, constitution, and objects of the Fund and its branches, and it was decided to appoint a Sub-Committee to consider the subject and to report before the Annual General Meeting. The Sub-Committee to consist of Major-Gen. Sir W. Donovan, Lieut.-Col. A. B. Cottell and the Secretary.

(6) The Secretary reported grants which have been received for the General Relief Branch since the last meeting:—

Hospitals in Northern Command, York	£41	7	0
The Cambridge Hospital, Aldershot	12	1	0
43rd General Hospital, Salonika	5	0	0

Also an application for the renewal of a grant of £6 which had been made to an old soldier of the Corps. This was approved.

(7) Correspondence was read relative to a proposed memorial to a distinguished officer, and it was decided to submit it to the Memorials Sub-Committee with the request that they would co-opt Colonel C. E. Tyrrell, C.B., to serve with them, and to report to the Committee on the whole question, including what form the memorial, if any, should take, before the Annual General Meeting on June 10.

It was also decided to submit propositions regarding portraits of Directors-General to the same Sub-Committee, and to request their report at the same time.

(8) The date fixed for the Annual General Meeting on June 10 at the College was noted and the circular approved.

The draft report for the year 1917 was also considered and approved.

(9) Applications were received for assistance from the Royal Drummond Institution and the Home for Destitute Catholic Children, at both of which Schools children of the Corps are being educated, and it was decided to grant the former £12 and the latter £10 from the Compassionate School Fund.

(10) The payment of £25 annual subscription to the Royal School for Officers' Daughters at Bath was approved, and it was decided that the amount should be paid permanently from the Officers' Branch.

(11) The payment of the undermentioned subscriptions was approved, and it was decided that they should be a permanent charge upon the General Relief Branch :—

Union Jack Club	£25	4	0
Corps of Commissionaires	10	0	0
Soldiers' and Sailors' Help Society	5	0	0
National Association for Employment of Reserve and Disabled Soldiers	5	0	0

(12) The Committee decided to recommend to the Annual General Meeting that Lieut.-Col. E. M. Wilson be re-appointed Secretary for one year from June 20, 1918.

ROYAL ARMY MEDICAL CORPS COMFORTS FUND.

Telephone : Victoria 3722. 124, Victoria Street, S.W., *March* 14, 1918.

DEAR SIR,—I venture to appeal to you on behalf of the Non-Commissioned Officers and Men of the Corps at present detained as prisoners of war in enemy countries. I think that perhaps many companies and detachments at home and abroad, and medical units serving in the Field, may not be aware of what has been and is being done by the Ladies' Committee of the Royal Army Medical Corps Comforts Fund for the relief and assistance of our comrades in this unfortunate position, although notices have appeared in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS "Corps News" from time to time and letters have been sent to individual units.

From the early days of the War parcels of food and clothing and little additional comforts have been supplied regularly to all men known to be prisoners. In some instances where parcels could not be sent small sums of money have been forwarded through the authorized channels, and from the number of grateful letters that have been received not only from the men themselves but also from their relations at home, it is certain that the help thus given has been simply invaluable, and has greatly alleviated the hardships of the men.

Money has been very generously subscribed by the depot at Blackpool and other units and by many officers and friends, and the Ladies' Committee had never yet failed in the regular dispatch of parcels, &c. ; but recently the number of prisoners has very largely increased, and there is a fear that unless further donations are received at an early date the funds may run short.

I feel certain that this has only to be brought to the notice of the Committees of Regimental Institutes at Home and Abroad to ensure the receipt of subscriptions sufficient to maintain the Fund for the duration of the War, and to prevent the possibility of any of our prisoners now or in the future being ever deprived of what is really necessary to their existence.

It will of course be understood that at the present time the vast majority of prisoners belong to the New Armies, Special Reserve, and Territorial Forces, and therefore all Canteen and Recreation Committees will be helping their own comrades.

The Annual Report for 1917 and Statement of Accounts is being published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS "Corps News," and will give full information regarding the Fund. All subscriptions should be sent to :—

The Hon. Secretary,
R.A.M.C. Comforts Fund, R.A.M.C. College,
Grosvenor Road, S.W.

or to me at the above address, and will be gratefully acknowledged.

Yours very truly,
E. M. WILSON, *Lieut.-Colonel.*
Hon. Treas., R.A.M.C. Comforts Fund.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF JANUARY, FEBRUARY AND MARCH, 1918.

Title of Work and Author	Edition	Date	How obtained
Text-Book of Ophthalmology. By H. E. Fuchs. Translated by A. Duane	5th	1917	Library Grant.
The Microtomists' Vade-Mecum. By Arthur B. Lee ..	7th	1913	,, ,,
The Basis of Symptoms the Principles of Clinical Pathology. By Dr. Ludolph Krehl. Translated by Arthur F. Beifeld	4th	1917	,, ,,
Hygiene and Public Health. By Whitelegge and Newman	13th	1917	,, ,,
Serum and Vaccine Therapy. By R. T. Hewlett ..	2nd	1910	,, ,,
The Refraction of the Eye. By G. Hartridge	15th	1911	,, ,,
Post-mortem Manual. By C. R. Box		1910	,, ,,
Injuries of the Face and Jaw and their Repair. By P. Martinier and Dr. G. Lemerle. Translated by H. Lawson Whale		1917	,, ,,
A Practical Guide to the Inspection of Meat and Foods. By A. E. Bonham		1915	,, ,,
Surgery of the Lung. By Garré and Quincke. Translated by D. M. Barcroft	2nd	1912	,, ,,
The Diagnosis of Nervous Diseases. By Purves Stewart, C.B.	4th	1916	,, ,,
The Indian Operation of Couching for Cataract. By Lieut.-Col. R. H. Elliot, I.M.S. (Ret.).		1917	,, ,,
The Roentgen Diagnosis of the Alimentary Canal. By Carman and Miller		1917	,, ,,
The Collected Papers of the Mayo Clinic. Vol. viii. Edited by Mrs. M. H. Mellish		1916	,, ,,
An Atlas illustrating the Topographical Anatomy of the Neck, Thorax, Abdomen and Pelvis. By J. Symington		1917	,, ,,
Tropical Diseases. By Sir Patrick Manson, G.C.M.G. ..	6th	1917	,, ,,
Diseases of the Skin. By Sir Malcolm Morris, K.C.V.O.	6th	1917	,, ,,
Blood Pictures: an Introduction to Clinical Hæmatology. By Cecil Price-Jones, Capt., R.A.M.C.		1917	,, ,,
The Thyroid Gland in Health and Disease. By R. McCarrison		1917	,, ,,
Nerve Wounds. By J. Tinel. Translated by F. Rothwell and C. A. Joll		1917	,, ,,
Fibrositis. By Ll. Llewellyn and A. Bassett-Jones ..		1917	,, ,,
The Practice of Medicine. By Sir Frederick Taylor, Bt.	11th	1918	,, ,,
The Treatment of War Wounds. By W. W. Keen ..		1917	,, ,,
Medical Electricity. By H. Lewis Jones	7th	1918	,, ,,
Syphilis and the Army. By G. Thibierge. Edited by C. F. Marshall		1918	Editor, Journal.
Journal of the Royal Naval Medical Service, January ..		1918	The Editor.
Cerebrospinal Fever in the Royal Navy, August 1, 1916, to July 31, 1917. (Reprint.) By Temp. Surg.-Gen. H. D. Rolleston, C.B.		1918	The Author.
The Kitasato Archives of Experimental Medicine. Vol. i. No. 2. October		1917	The Editor.
Forty-sixth Annual Report of the Local Government Board, 1916-1917. Supplement containing the Report of the Medical Officer for 1916-1917		1917	Commandant's Office.
Physical Remedies for Disabled Soldiers. By R. Fortescue Fox		1917	Presented by Surg.-Gen. Sir M. W. Russell, C.B., A.M.S., K.C.M.A.

LIST OF BOOKS ADDED TO THE LIBRARY—*Continued.*

Title of Work and Author	Edition	Date	How obtained
The Story of British V.A.D. Work in the Great War. By Thekla Bowser, F.J.S.		1917	Presented by Lieut.-Col. G. E. Twiss, C.M.G., R.A.M.C.
My Four Years in Germany. By James W. Gerard ..		1917	,, ,,
British Medicine in the War, 1914-1917		1917	Presented by Surg.-Gen. Sir D. Bruce, K.C.B., F.R.S.
Field Sanitation. By C. G. Moor and E. A. Cooper ..		1918	
History of the Delhi Coronation Durbar, 1903. By Stephen Wheeler		1904	Presented by Surg.-Gen. Sir W. Babtie, V.C., K.C.M.G., etc.
Dictionnaire des Termes de Médecine. Français-Anglais. Par H. De Meric		1899	Library Grant.
A German-English Dictionary for Chemists. By A. M. Patterson		1917	,, ,,
The Practitioner's Medical Dictionary. By G. M. Gould. Revised and Enlarged by R. J. E. Scott	3rd	1917	,, ,,
Le Paludisme Macédonien. Par Armand-Delile, Passeau, Abrami and Lemaire		1917	,, ,,
Leishmaniosis, Kala-Azar, Bouton d'Orient, Leishmaniose américaine. Par A. Laveran		1917	,, ,,
McNally's Sanitary Handbook for India. Revised and Re-written by A. J. H. Russell, I.M.S.		1916	,, ,,
The Biology of Twins. By H. H. Newman		1917	,, ,,
Twenty-two Months under Fire. By Brig.-Gen. H. Page Croft, C.M.G., M.P.		1917	,, ,,
A Roumanian Diary, 1915, 1916, 1917. By Lady Kennard		1917	,, ,,
In France and Flanders wth the Fighting Men. By L. Maclean Watt		1917	,, ,,
At the Serbian Front in Macedonia. By E. P. Stebbing		1917	,, ,,
Observations of an Orderly. By Lance-Cpl. Ward Muir, R.A.M.C.(T.).		1917	,, ,,
The Treatment of Infected Wounds. By A. Carrel and G. Dehelly. Translated by H. Child		1917	Presented by Sir A. Keogh, G.C.B.
Typhoid Fever and Paratyphoid Fevers. By H. Vincent and L. Muratet. Translated by J. D. Rolleston		1917	,, ,,
The Psychoneurosis of War. By Dr. G. Roussy and J. Lehermitte. Translated by W. B. Christopherson		1918	,, ,,
Hysteria or Pithiatism. By J. Babinski and J. Forment. Translated by J. D. Rolleston		1918	,, ,,
The After-effects of Wounds of the Bones. By A. Broca. Translated by J. R. White		1918	,, ,,
A Large Number of Books, Off-prints, and Correspondence on Tropical Medicine, especially Malaria, from the Library of Sir Ronald Ross, K.C.B., F.R.S., etc. (Not yet catalogued)			Presented by Sir Ronald Ross, K.C.B., F.R.S.

AUXILIARY ROYAL ARMY MEDICAL CORPS FUND.

THE usual Quarterly Committee Meeting was held at 11, Chandos Street, Cavendish Square, W. 1, on April 26, 1918. Grants were made to the orphans of three commissioned officers of the Auxiliary Royal Army Medical Corps, and to the widows of three of the rank and file of the Auxiliary Branch of the Royal Army Medical Corps. Applications for Grants, and Subscriptions to the Funds should be addressed to the Hon. Secretary, 11, Chandos Street, Cavendish Square, W. 1.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

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12	4	0 2 9	0 1 2	4 3	1 1	3 10	0 9
	8	0 5 0	0 2 3				
	16	0 8 3	0 3 11				
25	4	0 3 4	0 1 5	4 10	1 6	4 4	0 11
	8	0 6 0	0 2 9				
	16	0 10 6	0 5 0				
50	4	0 4 6	0 1 10	6 0	2 1	4 10	1 2
	8	0 7 6	0 3 6				
	16	0 13 3	0 5 10				
100	4	0 6 0	0 3 1	7 10	3 11	6 7	2 5
	8	0 10 0	0 4 10				
	16	0 18 6	0 7 6				
200	4	0 9 6	0 4 5	10 10	7 6	9 0	4 10
	8	0 15 0	0 6 7				
	16	1 6 0	0 9 8				

* These are not arranged as Reprints, but appear precisely as in the Journal with any other matter that may happen to appear on the first and last pages of the particular excerpt ordered.

Cases for Binding Volumes.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

Covers, 2s. 6d. net; binding, 2s. 6d.

These charges are exclusive of cost of postage.

In forwarding parts for binding the name and address of sender should be enclosed in parcel.

The above figures are subject to 25 per cent. increase.

All Applications for Advertisements to be made to—

G. STREET & CO., Ltd., 8, Serle Street, London, W.C.

The back outside cover is not available for advertisements.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

WANTED to complete set of Journal of R.A.M.C.: 1916, Volume 26, Nos. 2, 3, 4 and 5; 1916, Volume 27, Nos. 1, 2 and 5. G. E. STECHERT & Co., 2, Star Yard, Carey Street, Chancery Lane, London, W.C. 2.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 324, Adastral House, Victoria Embankment, E.C. 4.

A Communication has been received from Captain A. L. Anthony.

The following publications have been received:—

British: The Journal of Tropical Medicine and Hygiene, Tropical Diseases Bulletin, Agricultural Research Institute, Pusa, Transactions of the Society of Tropical Medicine and Hygiene, The Quarterly Journal of Medicine, The Hospital, Public Health, Guy's Hospital Gazette, Surgery, Gynæcology and Obstetrics, The Medical Journal of Australia, The Medical Journal of South Africa, The Medical Press and Circular, The Royal Engineers' Journal, Commonwealth of Australia Quarantine Service, The Practitioner.

Foreign: Office International d'Hygiène Publique, Annali di Medicina Navale e Coloniale, Bulletin de l'Institut Pasteur, Archives de Médecine et de Pharmacie Militaires, Archives de Médecine et Pharmacie Navales, The Military Surgeon, Bulletin of the Johns Hopkins Hospital, The Journal of Infectious Diseases.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," 25, Adastral House, Victoria Embankment, E.C. 4, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,
"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"
25, ADASTRAL HOUSE, VICTORIA EMBANKMENT, E.C.4.

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CONTENTS.

ORIGINAL COMMUNICATIONS. PAGE

A Clinical Study of some Functional Disorders of the Heart which Occur in Soldiers. By J. E. MACILWAINE, B.Sc., M.D., D.P.H. . . . 357

Notes on Sixteen Cases of Blackwater Fever Occurring in Malta. By Major J. A. ARKWRIGHT, R.A.M.C., and ELIZABETH H. LEPPER, M.B., B.S. . . 378

Some Musings of an Idle Man. By Colonel R. H. FIRTH 395

Report of a Base Laboratory in Mesopotamia for 1916, with Special Reference to Water-borne Diseases. By Captain T. K. BONEY, R.A.M.C., Captain L. G. CROSSMAN, R.A.M.C., and Lieutenant (U.L.) C. L. BOULENGER 409

A Time-governed Slide Method for the Agglutination Test on a Series of Microbic Emulsions. By Captain (local Major) W. BROUGHTON-ALCOCK, R.A.M.C. (S.R.). 424

CLINICAL AND OTHER NOTES.

The Carrying of the Wounded in Trenches. By Lieutenant B. GRAVES, R.A.M.C. 432

An Investigation into the Results from Treatment of Bacillary Dysenteries by Serum and by Salines Respectively. By GERTRUDE MARGARET DOBRASHIAN, M.B., B.S.Lond. 441

REVIEWS 448